THE
ELECTRICAL REVIEW

THE OLDEST ELECTRICAL PAPER
ESTABLISHED 1872

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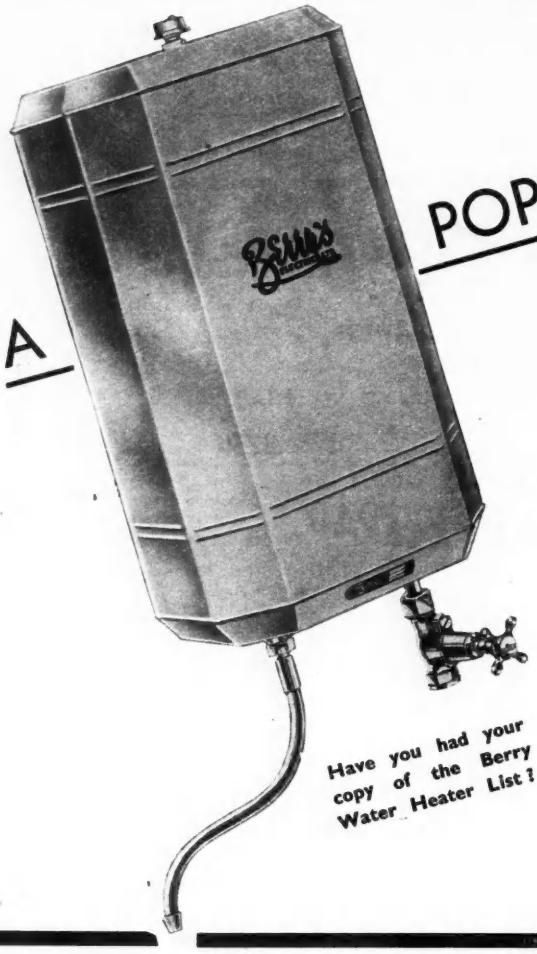

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THE OLDEST ELECTRICAL PAPER — ESTABLISHED 1872

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A Load-building Opportunity

Heating Autoplate Machines Electrically

LONG ago we learned how unwise it was to say that one heating medium was cheaper than another; there are so many interpretations of so many factors. It is a fact, however, that during a recent visit to the Manchester printing office foundry of Allied Newspapers, Ltd., in connection with an investigation into the heating of autoplate machines for the production of stereo plates for rotary presses, Mr. W. D. Leahy, works manager, said that the first year's working with electric heating of his installation showed a slightly lower fuel cost figure than would have been the case with gas heating, the medium previously used.

Time and again we have been warned of the impossibility of generalising fairly on the question of cost in respect of different localities because the whole matter rests so largely on the relative costs of different heating media locally. After a few weeks spent in thoroughly digesting the matter, then, and after discussing the subject with responsible members of the supply, manufacturing and contracting sections of the electrical industry, we say without fear or favour that it must be the job of someone in the electrical industry to find out why so important a development can make such headway in Manchester and not in, say, London or Glasgow.

An Extensive Field

Perhaps this has already been found out—Mr. Parker, of Odhams Press, Ltd., pointed to the difficult problem presented by DC supply in central London for instance—and we have no doubt that in any case a good answer can be given, but we say emphatically that no man with the interests of the electrical industry as a whole at heart can be satisfied with the position, for there must be very many autoplate machines throughout the country which could be heated electrically.

The development is not new, for such foundries have been served electrically in America for many years, and four electrically heated autoplates were established in Manchester at the *Daily Mail* printing offices as early as 1930. But in this country, we believe the development is almost, if not entirely, confined to Manchester, and we heartily congratulate the officials of the Electricity Department on the hard spade work they must have silently and tenaciously put into the development for the past several years, for Mr. Parker and other printing-office engineers emphasised that their heating supplies were taken at normal tariffs—an excellent example of electricity salesmanship.

From figures obtained from foundries which have previously used gas, it is found that in the average installation the heat units consumed by gas are approximately 2½ times greater, due to the high utilisation efficiency of the electric system. In other words, for every one hundred thousand B.Th.U. of gas the same output can be obtained with approximately forty thousand B.Th.U. of electricity, this being the equivalent of 11.7 kWh. It follows, therefore, that, omitting all other savings and benefits due to electricity, this compares favourably with gas on fuel costs only when the price per kWh is about 1/12th the price of gas per therm.

Where Electricity Scores

Why is it possible to heat such industrial equipment by electricity so economically? It is difficult to put the several reasons in the correct order of importance, but we should say probably the biggest influence is the elimination of the funnel chimney which is necessary over the gas heated equipment and which, by the creation of a strong air-flow over the molten metal, increases oxidation of the metal and hence dross. Dross is the bugbear of the foundry man, and Mr. Leahy said that it has been reduced in the Allied Newspapers' foundry by over 25 per cent.—representing a weekly saving of more than £7.

Radiation losses are also lower, mainly because structurally the electrically-heated bath can be heat-insulated much more efficiently and there are no flue losses. These radiation losses, however, reflect in themselves on the economic position, for their healthy effect on the load factor is pleasant for the supply man. Remember, the radiation load is a twenty-four hour one and each automatic autoplate has a radiation load of about twelve kWh per hour; and half-a-million kWh per annum at 100 per cent. load factor for an installation of four machines is not bad going. The unity power factor of electric heating and its effect generally on the printing office installation as a whole must not be forgotten either.

There are many other advantages of electric heating which must also have a money value. For instance, because of the absence of hot-spots associated

with gas heating and the more uniform heating permitted electrically, by the accuracy of temperature control and even transfer of heat the casting metal is more consistent and, in consequence, better printing results are obtainable, defective plates being entirely eliminated. Temperature control is provided to an accuracy of ± 2 or 3 deg. F. The lower temperature of the atmosphere in the foundry and the obvious benefit to the health of the operatives brought about by the absence of fumes are also important points. The survey elsewhere in this issue is particularly interesting in that it relates to installations with entirely different characteristics—conversion from gas (Allied Newspapers), conversion from oil (*Manchester Guardian*) and the entirely new machines at Odhams Press.

Wiring Guide

IT in no way implies an adverse criticism of the I.E.E. Wiring Regulations to welcome the A.S.E.E. Guide to the Eleventh Edition. The official Regulations must be meticulous enough in phraseology to avoid the possibility of legalistic misinterpretation of any detail. For those who have to put the Regulations to practical use, however, something simpler is required, and the unofficial interpretation given in the Guide will be found to meet the purpose very well, bearing in mind that the hand-book is intended for the use of trained electricians. Especially good features are the diagrams and the notes explaining the bearing of some of the provisions. It further simplifies the hand-book that Regulations which are of no direct interest to the operative and definitions which he should know as a matter of course have been omitted.

Indecision at Morecambe

THE Morecambe and Heysham Town Council appears to be unable to make up its mind about the salary to be paid to the new borough electrical engineer when he is at last appointed. The post was originally advertised at £575 per annum, rising by annual increments of £75 to £800. Immediately a ban was put on applications from their members by the A.M.E.E. and E.P.E.A., who considered that the job was worth £945 as a minimum commencing salary. Subsequently the Council compromised by re-advertising the position at £700 per annum, rising by annual increments of £50 to £800. At last week's meeting of the Council the matter was again discussed, and apparently (to quote the *Yorkshire Observer*), because "there were in the town hundreds of people unable to pay their rates," it was decided to go back to the original figure and interview candidates who had answered the first advertisement. That is how the matter stands at the time of going to press.

Commissioners' Returns

SURELY Mr. Bolton is right in deprecating, as he does in his letter to us this week, any question of suppressing Engineering and Financial Statistics "for the duration." The reasons for such a course are difficult to discover. Economy can hardly be one of them. The compilation of selected statistics has proved to be very well worth while. Indeed, it has been one of the most useful activities of the Electricity Commissioners, and has certainly promoted the ordered progress of electricity supply. Presumably the supply industry will not be allowed to go without records of development at a time when they are likely to be more valuable than ever, and no doubt the essential figures will be collected as hitherto. If it is considered undesirable to publish details of output of individual undertakings for the time being, bulk figures would be a good deal better than nothing. That compromise, however, is unnecessary in regard to the returns to be looked for in the sixteenth volume, which would normally have been issued about a month hence. Information as to what happened in the year ended March 31st, 1939, for municipal undertakings, and three months earlier for the companies, could hardly be helpful to the enemy. The same general arguments apply to the other publications of the Commissioners.

Duplicate Grid Supplies

IN response to representations made by the I.M.E.A., the Central Electricity Board has expressed its views on the provision of a second point of supply from the grid. This is at present considered as entirely separate and subject to the grid tariff for the area, and the Association sought a modification of this attitude. The Board regards the matter as falling under two heads: (a) where a second point is required solely for use in an emergency involving the interruption of the first point, and (b) where a second point is needed to deal with part of an undertaking's normal requirements. It is thought that there may be a case of merging the original and second points of supply in case (a), and sympathetic consideration would be given to applications under this head. With regard to (b) this seems to be a means of saving the undertaking distribution expenditure, which was not the purpose of the grid. Consequently, the Board can hold out little hope of a supply being given under this head other than at the terms of the grid tariff.

Manchester's Example

THE inadequacy of contributions to the Electrical Industries' Benevolent Association has been repeatedly stressed in these pages, and ways and means of increasing its funds have been discussed. At an informal lunch of the Manchester branch of the Association on Monday last, which we report in this issue, an interesting suggestion was made by the Lord Mayor of Manchester (Alderman G. H. White), who said that while the voting of a definite annual subscription by a city council presented difficulties, there was no reason why a corporation should not vote a lump sum of, say, £250 which would be more than the equivalent of £50 per annum for five years. Manchester City Council, which was the first city to go to the aid of the Association, contributed £100 five years ago, and we understand that a proposal is to come before the Electricity Committee to grant a further £250 to cover the next five years. Alderman White's suggestion has so much to commend it that we may excusably hope that what Manchester does to-day other municipalities will do tomorrow.

Lighting Progress

DURING the past three years activities in illumination technique have been mainly in the direction of stabilising the position previously reached. The principal problem at the moment would appear to lie in the choice from several alternatives of the most suitable method for any particular purpose, and this is reflected in the frequent references to economic values in the I.E.E. Review of Progress in Electric Illumination. Probably the most important of the recent developments discussed by Dr. C. C. Paterson is the low-voltage tubular fluorescent discharge lamp which, in an 80-W size, has now become available to the public.

The "Truce"

NOT all of the gas industry is overwhelmingly in favour of the "truce" between gas and electricity suppliers. We seem to be quoting the *Gas Times* rather frequently nowadays but here it is again:—

> "The country is even more in need of gas service than previously, both in its private and public capacities. That being the case and gas salesmanship being mainly concerned with explaining the value of gas service to the public, and not, as might be supposed by some, in trying by trick to thrust an unwanted commodity on to an unwilling buyer, we see no reason why gas salesmanship should be voluntarily restricted. It is quite another thing to apply reasonable checks against overselling in the abnormal conditions created by war."

Substituting "electricity" for "gas" where necessary, these are our sentiments.

STEREO PLATE CASTING

An Industrial Electric Heating Development

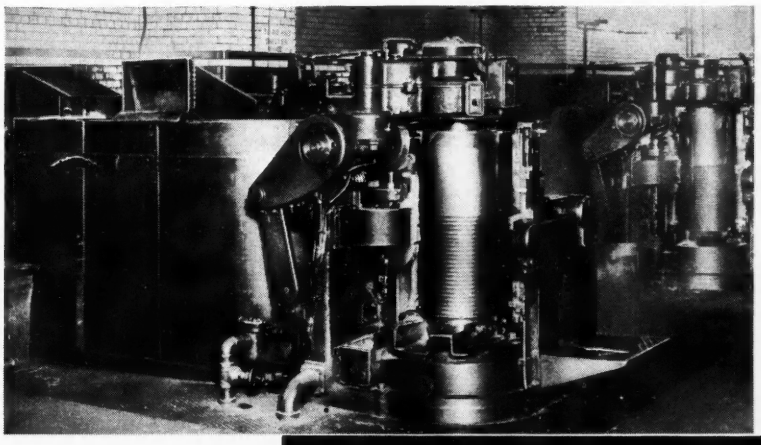
A survey of the progress that has been and is being made in the application of electric heating to autoplate machines for the production of stereo plates for rotary printing presses

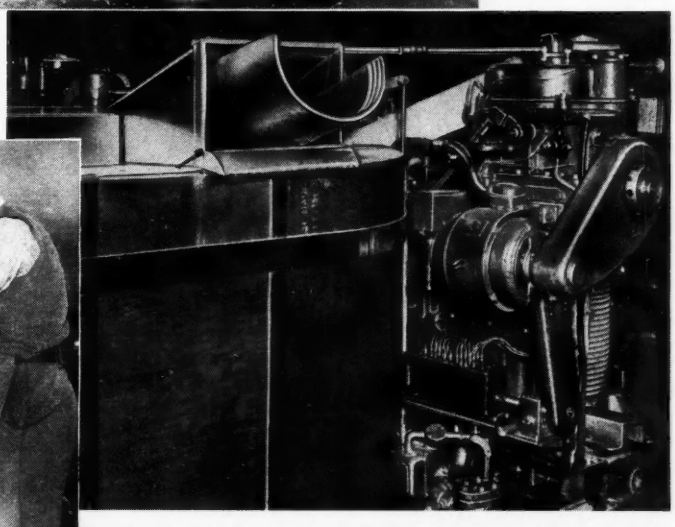
ALTHOUGH for some years past much has been done in America in the electric heating of autoplate machines for the production of stereo plates for rotary presses in newspaper printing works, and pioneer work in England took place as long ago as 1930 at the *Daily Mail* offices in Manchester, where four electrically heated autoplate machines loaded at 120 kW each represented, it is claimed, the first electric printing works foundry in Europe, the next major move was not until about a year ago. At about that time and in connection with their reorganisation scheme, Allied Newspapers, Ltd., decided to electrify completely the autoplate installation at their Manchester offices, which is probably the largest foundry of its kind in Europe, with an output in normal times of nearly 20,000 plates per week, that is, 900 tons of cast metal. The scheme involved converting from gas to electric heating two each of the existing "Automatic" and "Junior" machines and installing a new "Automatic" unit. General reconstruction of the converted machines has resulted in similarity in all respects to the new equipment.

The "Automatic" machines each have a casting capacity of four plates per minute, and the two "Junior" equipments will each deal with three plates per minute, the plates averaging from 60 to 70 lb. each. The autoplates are fitted with baths, each having a capacity of about 7½ tons of stereo metal which is kept molten at about 650 deg. F. when casting is in progress and at about 450 deg. F. during stand-by periods. It takes about ten minutes to raise the temperature from 450 to 650 deg. F.

The equipment was manufactured and installed by Barlow-Whitney, Ltd., in close collaboration with Mr. W. Leahy, works manager, and Mr. Page, electrical engineer, Allied Newspapers, Ltd. The special immersion heaters are of grid construction, thus permitting the molten metal to circulate freely through and around the elements to ensure even and rapid transfer of heat. The units are bolted to the top rim of the furnace and each comprises a number of separate tubular elements so that any section can be replaced without scapping the complete heater. The heaters are loaded at 12-kW each and are supplied at 400 V, three-phase.

Each "Automatic" machine has an installed heating load of 264 kW and each "Junior" machine is loaded at 228 kW. About a quarter of this is reserve load which is only brought into circuit in the event of a failure on any section. So far as we can ascertain, this is the first time that metal-sheathed tubular heaters have been directly immersed in cast metal, and the result has been most efficient operation. Each heater comprises a bank of 2-kW "Metrovick" tubular-sheathed type elements directly immersed in the type metal. Each element has a cold





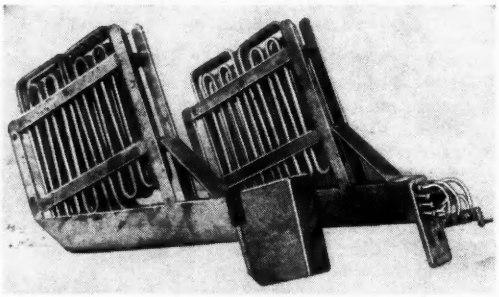
Above: Two of the "Automatic" autoplate machines of Allied Newspapers, Ltd. Below: Removing stereo plate from machine

Cylinder driving arrangements of "Automatic" autoplate, showing both-filling chute (Allied Newspapers)

extension which projects through the surface of the molten metal and permits of direct connection to the terminals at the rim of the bath.

Advantage has been taken of a sub-basement under the foundry to make a really excellent layout of the switch and control gear for the autoplate installation. A main ironclad switchboard renders the whole installation completely self-contained from the supply point of view. It is in duplicate form to prevent the autoplates being put out of service on account of supply failure, and there are duplicate incoming feeder cables to the board, each serving normally three outgoing circuits. In addition, a bus-bar coupling switch affords flexibility of working of the switchgear. There are nine industrial-type panels on the board, the two end ones being cubicles containing isolating switches. A centre cubicle contains the bus-bar coupler and the other six panels, three each side of the bus-bar coupler, comprise 500-A, 25,000-kVA rupturing capacity circuit-breakers.

Surmounting each of the machine feeder circuit-breakers and connected to and interlocked with it is an auxiliary low-capacity feeder circuit-breaker for the supply to certain heaters in the bath, which prevent the metal freezing when the autoplate is not actually in use. These auxiliary circuits are each fitted with a t.p. knife switch with three high-rupturing-capacity fuses. The mechanical interlock between the main oil switches and the auxiliary switches prevents both of the circuits being closed at the same time.



Spare immersion-heater units for autoplate machines

The feeder oil switches and bus-bar coupler switch, although ironclad, are so designed and interlocked that inspection of the current-carrying parts can be made with safety, the interlocking system ensuring complete automatic isolation from the live bus-bars when an attempt is made to lower the unit for inspection.

For the "Automatic" autoplates each feeder switch supplies its machine via a five-way, 100-A, three-phase iron-clad distribution panel and enclosed contactor cubicle, the latter being provided with suitable lamps so that circuits in service can be readily determined.

The heaters are divided into five sections, each controlled by a contactor and so arranged that any section can be switched independently or collectively as may be required.

These five sections are in two groups, viz., "stand-by," comprising sections 1 and 2 which are used alternately for radiation losses during idle periods; and "casting," comprising sections 3, 4 and 5, which are only brought into use when the autoplate machine is actually in production.

Arrangement of immersion heaters in bath of molten metal in autoplate (Odhams Press)

The arrangement of the "Junior" machine is similar, except that on account of the lower load the heaters are in four sections, arranged in two stages as above. Contactors are operated by two dial-type control thermometers mounted flush in the external casing of the machines, working in conjunction with sensitive relays. One instrument normally controls the "stand-by" group and the second the "casting" group, but any contactor can be isolated, and in the event of failure of either instrument or relay there is a switch incorporated which couples all contactors to one relay and instrument, thus obviating any delay in production. In addition, there is a third thermometer which gives visual and audible signals in the event of excessively "high" or "low" temperatures, and in the former condition trips out the main circuit-breaker feeding the machine. There is also incorporated a float switch which governs the level of the metal in the bath.

The heaters are arranged in three banks of five, one of four and one of three, and they are so installed in the bath that any section will give even distribution of heat. The method of supply from the control panel to the bath is by means of vertical copper bus-bars rising from a steel chamber on the ceiling below to distribution points on the rim of the bath. From this point three-core p.i. cables are run to the control panels which, with the switchgear, were built to Barlow-Whitney's requirements by Erskine, Heap & Co., Ltd.

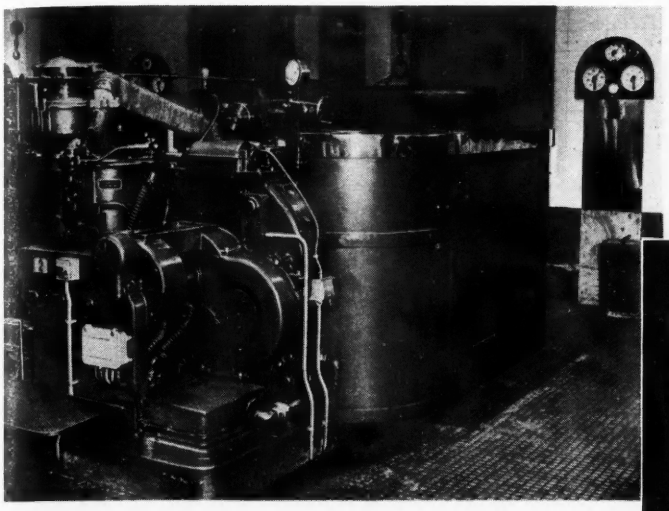
The molten metal in the bath is continuously mixed by means of ½-HP motor-driven propeller with chain-gear transmission. When casting, the metal is pumped out of the bath into the casting box which contains the mould and is there allowed to remain for about 12 seconds for setting. The casting box then opens and the cylinder revolves with the cast plate on it. The plate is taken off the cylinder by hand and fed into an auto-shaver where it is bored to correct thickness ready for delivery to the printing press. The main motor drives the machine as one unit through the main gearing in which is a heart-shaped cam slot by which the pump is operated at the point of indentation. The cylinder is driven off a cross shaft via chain and flywheel from reduction gear on the main shaft.

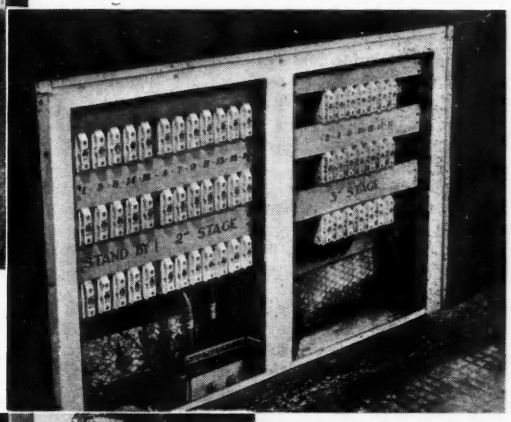
The question of heat insulation becomes of even greater importance with electric heating and, briefly, the bath sits in a bed of insulating bricks on a red brick base. Around the brickwork there is a one-inch layer of asbestos and between this and the autoplate machine casing there is an air space.

The loss of metal by oxidation is reduced by over 25 per cent., due mainly to the facilities afforded by the system to protect the surface of the metal almost entirely from contact with the atmosphere. We are informed that the radiation losses do not exceed 8 kW per hour.

Since the completion of the Allied Newspapers installation, electric heating has been established at the foundries in Manchester of Odhams Press, Ltd., and the *Manchester Guardian*, with improvements based on the experience gained at the first-mentioned installation. The reorganised foundry at Odhams Press now houses two "Automatic" and two "Junior" electrically heated autoplates, with a loading of 768 kW, the normal output of the foundry being about 7,000 casting plates per week.

The immersion units for these later installations incorporate a few improvements, although they are basically similar to the earlier ones. The shape of the units now follows more closely the contour of the bath, and this enables them to be set deeper in the metal. The terminal ends have also been lengthened and modified so that connections are more accessible and operate



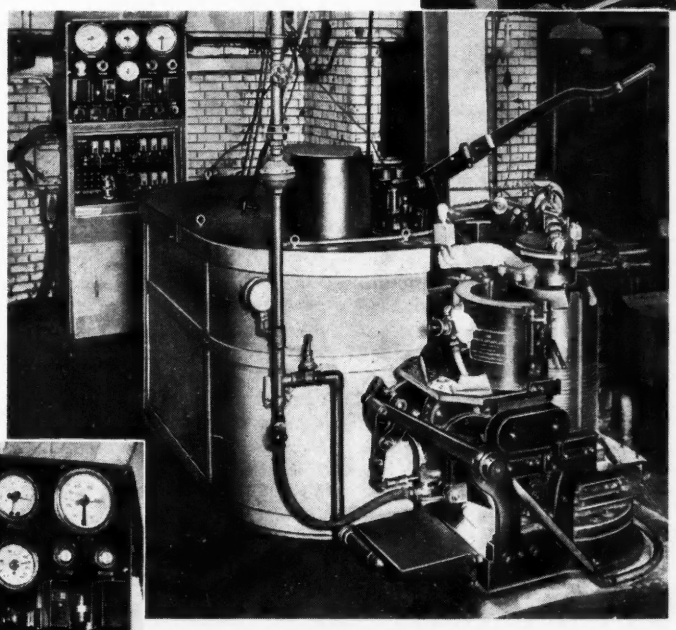


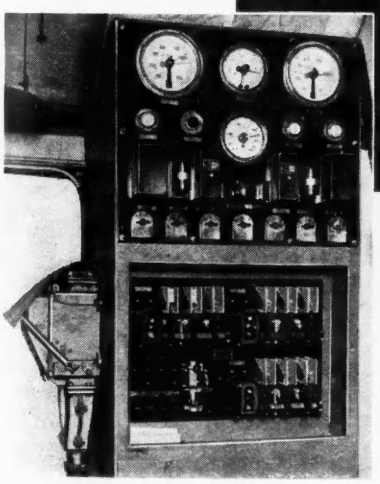
Above: "Automatic" autoplate at Odhams Press, showing heating controls in wall. The heater fuses are arranged in the side of the machine (right)

at a lower temperature. Each unit comprises a number of tubular elements mounted in special frames, the total loading being 12 kW for operation on single or three-phase supply. They are so designed that a faulty section can be readily replaced.

Accurate temperature control is also arranged automatically and the normal variations do not exceed a few degrees F. The heating units, which are individually fused, are divided into three main sections. Number one section (stand-by) comprises a few heaters distributed throughout the bath to maintain the metal constantly in a molten condition, and sections numbers two and three comprise the rest of the heaters and are referred to as the "casting stages." Each of the above sections is provided with a separate contactor. Two main indicating control thermometers are provided, one of which deals, via suitable relays and contactors, with the stand-by stage, while the second control deals with the two casting stages. These two control thermometers, together with an alarm thermometer and pilot indicators, are mounted on semi-circular panels let flush into the tiled walls facing the machine.

The switchgear is installed on the floor below. The control for the stand-by stage is set to maintain such temperature as will keep the metal from freezing, namely, about 500 deg. F., and the second control is set at an operating temperature of about 575 deg. F. A key-operated switch with a pilot lamp is mounted on the machine and connected in series with this control, so that in the "off" position the casting-stage contactors cannot close, and in consequence the bath is maintained by the stand-by stage at the lower temperature.





Above: The "Manchester Guardian" has converted one of its autoplates from oil to electric heating. Left: complete heating and electric control housed in one cabinet

Shortly before casting is due to commence this switch is turned on and immediately the contactors for the casting stages close, the metal being rapidly brought to, and maintained at, the casting temperature of 575 deg. F. As a result of this rise in temperature the stand-by contactors open and remain open as long as the machine is in use. When casting ceases the switch is turned off and the temperature falls back to the lower setting at which it is automatically held by the stand-by stage. This is the only manual operation that is required and is part of the regular routine of the maintenance staff when preparing the machine for casting.

The switchgear, of Barlow-Whitney construction, comprises four steel cubicles mounted side by side and forming a complete switchboard, each panel being fed by means of p.i., l.c. and armoured cables from a busbar chamber at one end provided with a main 1,500-A circuit-breaker. Each panel comprises a t.p. English Electric iron-clad switch-fuse controlling the incoming feeder to three 150-A Erskine Heap contactors. Various operating and safety relays, together with pilot lamps,

(*Concluded at bottom of next page*)

TRANSFORMER FIRE RISKS

Methods of Achieving Fireproof Construction and Their Limitations

By E. T. Norris, M.I.E.E., Fellow Am.I.E.E.
(Chief Designer, Ferranti, Ltd.)

SERIOUS damage due to fire in generating stations and sub-stations, though fortunately rare, has been sufficiently disturbing during recent years to draw attention to the possibilities of reducing the fire risk due to transformers in general, and to the large majority of oil-immersed transformers in particular. There is no general solution of this problem and particular methods all involve an appreciable increase in cost, so that in considering any particular case it is important to bear in mind the degree of risk.

The proportion of fires due to electrical causes is relatively small, even including the ubiquitous "fusing of an electric wire," and transformers are involved in a very small proportion of these electrical fires. No official information on this proportion is available, but the figures published in "Electrical Accidents and Their Causes, 1938" (Home Office) may be taken as a guide. These figures ascribe six out of 560 accidents to transformers.

Frequently the material damage is a relatively minor item; much more serious is the resulting interruption to the supply and the dislocation of control circuits and protective gear. The reduction in reserve plant while the damaged apparatus is being replaced is also important.

Causes of Transformer Fires

Fifty years of operating experience show that under normal operating conditions transformers may be considered practically immune from fire, even when oil immersed. The flash-point of transformer oil is not less than 145 deg. C. (B.S.S. 148—1933) and is usually more than 160 deg., while the fire point is, of course, higher still. The most severe loading conditions permitted by the B.S.S. for transformers (171—1936) involve a hottest oil temperature of 90 deg. C., but this value is rarely reached in normal service.

Transformer fires are due in general either to internal breakdown or external ignition. The great majority of internal failures occur in the windings between turns and coils as a result of external short-circuits, or of lightning surges. The first desirability is to disconnect the transformer as quickly as possible so that the power-frequency short-circuit currents in the windings shall not extend the damage. This is usually a matter of suitable protective gear. The Buchholz or similar type of relay, though it does not prevent failure, probably serves a useful purpose here in restricting the damage.

External ignition may be due to a neighbouring fire or to the failure of adjacent apparatus. The present possibility of enemy air raids is an additional risk which accounts for much of the recent interest in this problem. It is not the purpose of this article to deal with external methods of fire localisation and extinction. Considerable information has recently been published on this aspect of the subject, dealing with matters such as the segregation of apparatus, separating walls, drainage pits for leaking oil, and fire-fighting systems.*

Eliminating Burning Oil Risk

The oil used in transformers serves two important purposes —insulation and cooling. The electric strength of transformer oil is three or more times that of air and its permittivity is nearer that of the solid materials used for the conductor and major insulation, so that the tendency to excessive local stresses and corona is greatly reduced.

Thermally, the oil serves to transfer by convection (or, in the case of large power transformers, by forced circulation) the heat generated in the core and coils to suitable heat dissipators, which in small units may be the plain tank surface, but in larger units will be specially designed cooling surfaces or radiators. In consequence, the means of heat dissipation into the surrounding atmosphere may be transferred from the

*See, for example: Electricity Commission publication, "Fire Risks in Generating Stations, &c." Stationery Office. E.R.A. report on "Fire-fighting Equipment for Electrical Installations." *Journal I.E.E.*, No. 516, December, 1939.

Stereo Plate Casting *(Concluded from preceding page)*

auxiliary circuit switches and an ammeter, are mounted at the top of the panel. Provision is made so that, in the event of a fault developing on either of the main control thermometers or their respective relays, either instrument can deal with the total load.

Safety features include visual and audible warnings for excessively high and low temperatures, and in the former condition the contactors cannot close. Similarly, unsafe conditions which might arise from excessively high or low levels of the molten metal are protected by a system of low-voltage relays operated by means of electrodes in the metal which cause warning signals to function and trip the contactors. Normal operation is automatically restored when the molten metal is adjusted to a safe level. The h.r.c. cartridge fuses protecting the individual heaters are mounted in the machine casings, connections to the heater terminals being made with three-core heat-resisting "Rockbestos" cable. The fuse banks are in three sections and are fed by three three-core 0.1 sq. in. cambric insulated and l.c. cables from the contactor panels below.

Careful consideration has been given to accessibility for drossing (oxidised metal) and general inspection by allowing the whole of the insulated top cover to be raised clear by means of winding gear. The plates and tails which go back into the machines when casting is taking place pass through special chutes with skid rails built integrally into the top cover, two chutes being provided on each "Automatic" machine and one on each "Junior."

At the *Manchester Guardian* offices Mr. Guthrie, works manager, recently decided to convert one of the three "Junior" machines from oil to electric heating. The electric heating system installed is generally similar to that of Odhams Press, Ltd., except for one or two modifications in layout due to local conditions. For instance, it was necessary to mount the control gear on the foundry floor within a few feet of the machine and a special self-contained panel was therefore designed which incorporates the main switch, contactors, relays and the individual heater fuses and control thermometers together as one unit. Connections between the heaters have been run under the floor in special three-core cables.

The plates produced in this foundry are exceptionally large, weighing, with their tails, a little more than 100 lb. each, and it was originally decided to load the machine at 180 kW. As, however, room was available in the bath for three additional spare units, these have been inserted and wired up, although the circuit fuses are normally withdrawn. The machine has been lagged and cased in as previously, a large section of the top cover carrying a chute and skid rails being easily lifted by a winch for drossing and inspection. Connections to the existing overhead flue pipe have been made from the front end of the machine. Erection was carried out by the *Manchester Guardian's* engineering staff, working in conjunction with Barlow-Whitney, Ltd.

We are indebted for help in collecting the above information to Mr. W. D. Leahy, works manager, Allied Newspapers, Ltd.; Mr. W. W. Reich, works manager, Odhams Press, Ltd.; Mr. Guthrie, works manager, Manchester Guardian and Evening News, Ltd., and Mr. Barlow, managing director of Barlow-Whitney, Ltd. Incidentally it is of interest to learn from Mr. Barlow that complete electric heating equipment is in hand for two new autoplate machines now being constructed by the Linotype Co. for the *Sydney Morning Herald*, Australia.

windings themselves, where facilities are greatly restricted, to specially designed cooling apparatus untrammelled by electrical and magnetic considerations. These advantages are enormous and alone would justify the use of oil. These functions of transformer oil in conjunction with its cost result in such economy in material, space and reliability that oil immersion is practically universal except for very small ratings.

Although transformer oil is unlikely to initiate a fire, there is no doubt that it frequently helps to spread it and to extend the damage. The only ways of eliminating this danger are (a) to use a non-inflammable oil, and (b) to use no oil at all, *i.e.*, to employ air cooling (B.S.S. types AN and AB). The advantages of a non-inflammable oil are obvious, but no natural product has been found having also the other physical characteristics necessary for insulation and cooling.

Synthetic Media

Among synthetic materials a chlorinated diphenyl, known under the name of "Aroclor" in this country, has suitable characteristics. For use in transformers it is usually diluted with trichlorbenzene, and in this form is marketed under various trade names such as "Pyranol," "Permitol," &c. They are not manufactured commercially in this country. These compositions are not only non-inflammable in themselves, but when decomposed by an electric arc evolve only non-inflammable gases. They are not suitable for use in existing transformers.

For new apparatus, however, suitable insulation presents no difficulty. To prevent evaporation of the liquid the transformer tanks are hermetically sealed, with provision for the expansion and contraction due to changes in temperature. A 6-in. ventilating pipe to the outside air is also necessary unless the room is adequately ventilated, or unless a special gas absorber is installed. These oils are considerably more expensive than ordinary transformer oils, and have been on the market for a number of years, so that their range of application may be considered established.

The alternative (b) is the so-called air-insulated transformer, with either natural or forced-air circulation. The winding insulation is usually an organic fibrous material, such as paper or cotton, impregnated with varnish or compound. Although this insulation is not non-ignitable the fire risk is generally considered negligible and these transformers are frequently specified by local authorities for installation in such places as hotel basements, where a fire might have exceptionally serious consequences. The absence of oil insulation limits the voltage of these transformers to 11 kV as a general rule, while the ratings are restricted by cooling requirements to small and medium sizes. The limitations in rating are particularly severe when in accordance with the B.S.S. for Class A insulation. However, in many cases advantage is taken of loading conditions and variations in ambient temperature to permit nominal ratings greater than the B.S.S. values. Fortunately these conditions frequently obtain in sub-stations supplying large shops and hotels where exceptional protection against fire is required.

Fireproof Transformers

The ideal transformer would be, of course, one in which all the materials employed were completely fireproof. This ideal has not yet been attained, but recent developments have brought it much nearer. The major parts of a transformer are iron, copper and insulation. The first two are practically fireproof, but the insulation has hitherto been the real difficulty. For many years asbestos and mica have been available, but both these materials have serious limitations. The former is hygroscopic and not readily suitable for any but very low voltages. The latter is expensive and not easily workable by itself. These difficulties apply particularly to the coil and turn insulation, where the working temperature is greatest. B.S.S. 171—1936 legislates for the use of these materials in conjunction with organic binders or fillers, with suitably increased permissible temperatures, but they have been very little used in practice.

Within recent years a new material has been developed consisting of woven glass fibres, of which technical information has recently been given in the ELECTRICAL REVIEW†. The material itself is, of course, non-inflammable and non-ignitable, but the electric strength of the textile alone is too low for most purposes. This is partly due to the air spaces and partly because, although it is not hygroscopic in the sense that the solid fibres can absorb water, yet the woven material can pick up moisture by adsorption and by capillarity between the fibres. The full benefits of the glass fibre can therefore only be obtained in combination with a similarly non-ignitable inorganic filler. It is the latter material which is still lacking for the achievement of ideal fireproof qualities. However, recent developments in synthetic and other insulating materials have produced suitable impregnating compounds capable of withstanding very much higher temperatures than the ordinary varnishes and gums, and improvements are still rapidly being made in this direction.

The use of glass fibre, in common with other non-ignitable materials, appreciably increases the cost of the transformer. This increase may be partially offset by taking advantage of the temperature-resisting qualities to run at higher operating temperatures. Such operation tends to lower the efficiency of the transformer and may necessitate screening or other protection against burns due to contact with the transformer structure. Special attention will also be necessary to the cooling and ventilation. The higher operating temperature may alternatively be utilised in increasing the maximum kVA rating permissible for a given type of cooling, i.e., natural or forced-air circulation. This is equivalent to extending the kVA range of the ordinary air-insulated transformers. The chief advantages of transformers with glass fibre or other inorganic insulation over the normal air-insulated type are therefore the higher maximum kVA rating and an increase in non-inflammability pending the achievement of the completely fireproof construction.

Conclusions

The foregoing considerations show that little can be done in improving the inherent fire-resisting qualities of power transformers without appreciable increase in cost and usually a sacrifice in the technical performance and ease of installation. Even so, the improvement is limited virtually to transformers in distribution circuits. Large power units, such as grid and generator transformers, would not be practicable in their present ratings without a cooling and insulating liquid, while the cost and other restrictions of the non-inflammable oils so far available have precluded their consideration. For these large units reliance must be placed on external methods of fire localisation and extinction.

There appears therefore to be no immediate prospect of any basic alteration in the design and construction of ordinary transformers for transmission and distribution purposes even in the smaller sizes. Fortunately, recent developments in fire-fighting and fire-extinguishing apparatus have been very effective; these, together with precautions in isolation and localisation of damage which are practically and economically possible, make it in general unnecessary to incur a large increase in cost or complication to achieve a fireproof construction of the transformer itself. So that, even taking an optimistic view of promising future developments of the fire-resisting constructions just described, it seems that the increased cost and other limitations will restrict them to special cases where other precautions are difficult or impossible and where a fire might have exceptionally serious consequences.

† "Glass Insulation." January 5th, 1940.

Quartz Oscillators

SOME years ago the Department of Scientific and Industrial Research issued a book summarising the available information on the construction, properties and many applications of quartz crystals. A new edition now issued (H.M. Stationery Office, 4s. 6d. net) has been largely rewritten by the author, Dr. P. Vigoureux, who was until lately a member of the staff of the National Physical Laboratory.

One of the most important applications of quartz oscillators of this kind is to control the wavelength of wireless stations. Another is to the production of extremely accurate clocks employed in standardising laboratories and astronomical observatories. By means of an oscillating valve controlled by a quartz crystal AC of 1,000 cycles per second is produced and is used to drive an electric motor in synchronism, geared to drive the seconds hand of the clock. Since the frequency of the current from the quartz controlled oscillator remains constant to two parts in 100,000,000 for perhaps a year on end, clocks of this kind can be made to keep correct time to within 1/500 second a day. Other applications referred to are the use of quartz crystals in the production of filters for highly selective radio receivers and for use on telephone networks. Some of the earliest applications described date from 1918, when Langvin developed apparatus for depth sounding, etc.

Fluorescent Paint

ONE of the BS/ARP series prepared at the request of the Ministry of Home Security is BS/ARP18 for fluorescent and phosphorescent paint having a maximum brightness of 0.01 equivalent ft.-candle. A method of testing brightness is included which may, however, be difficult for laboratories not specially equipped for this work, and the Committee is therefore endeavouring to provide a simple form of brightness test which, when completed, will be issued as an addendum to the specification. A preliminary draft is available for comment on application by anyone interested, although it must be understood that it cannot be regarded as a standard test until published as such. Copies of the specification can be obtained from the Publications Department, British Standards Institution, 28, Victoria Street, London, S.W.1, price 8d. post free.

POWER STATION PERFORMANCE

Estimating Probable Results

By R. C. Golding, M.Sc.(Eng.), A.M.I.E.E.

IN recent years use of load duration and load energy graphs has done much to simplify the estimating of probable plant performance, since it allows the output which is available to any proposed new plant to be ascertained almost at a glance. It is customary, however, to deal entirely in ideal loads and performances since, even when the load available is known, operation in strict accordance with this ideal is found to be impossible.

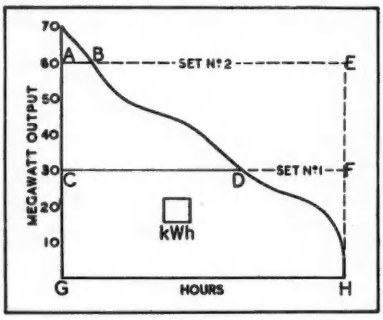


Fig. 1

There are two factors which tend to reduce the ideal output of a base-load turbine or boiler, these being non-availability due to the necessity of maintenance and another factor to which has been applied the name "operation ratio."

It will often be found that a set — or more commonly a boiler—is not producing the output which theoretically should be allocated to it, and this is classed as being due to non-availability, whereas in reality non-availability only accounts for part of the discrepancy, the rest being due to poor operation. It remains to obtain a method of assessing how many kWh are still available for a set if, due to the activities of the maintenance engineer, it is only on the bars for, say, 90 per cent. of the time.

Plant Availability and Ideal Output

Fig. 1 shows a load duration curve for a load of 70 MW, which is met chiefly by a base-load set of 30 MW. Then the area below the 30-MW line gives the ideal number of kWh that can be generated by the 30-MW set if 100 per cent. available. Assuming, however, that the set is only 90 per cent. available, there are two methods of arriving at the possible kWh, viz., (a) by taking the ideal kWh and multiplying by 90 per cent. or (b) by stepping off a new line at 90 per cent. capacity and measuring the kWh below this line.

These methods, however, both give incorrect results in any other instance than that of the base-load set. In this particular case it is assumed that the set is withdrawn for maintenance at indiscriminate periods, although there will, of course, be a tendency to defer minor adjustments to times of light load. In this event the set or boiler will be withdrawn at its average load or, in effect, the correct output can be obtained by multiplying the ideal number of kWh by the availability factor, assessed on hours run. For other than base sets, however, this maxim will not apply.

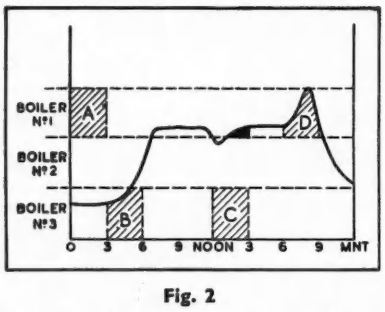


Fig. 2

In fig. 1 assume that a 60-MW set is running. Then the 30-MW line will be equivalent to applying method (b) above, with 50 per cent. availability. It can easily be seen that the area A B D C will not equal 50 per cent. of the kWh below the line A B, since this is only true of the area A E F C, which is 50 per cent. of the kWh that could have been generated with a 100 per cent. load factor. Thus the two methods would only agree in their results if the station had a block load. It remains to obtain a method of assessing availability which is applicable to a load duration curve.

The study of a typical load curve as in fig. 2 is simpler if we consider the instance of a number of boilers of equal size and performance. Assuming only one boiler to be out of commission at any time, let us consider the effect of boilers breaking down for three-hour periods as shown at (A) (B) (C) (D). If boiler No. 1 is withdrawn between midnight and 3 a.m. obviously no output is lost. When boiler No. 3 comes out at 3 a.m. No. 1 can replace it and no output is lost.

When No. 3 comes off the range between noon and 3 p.m. No. 1 will take over the base load and the only output which will be lost is the small amount shaded black, which No. 1 would otherwise have done. The loss of No. 1 at 6 p.m. will, however, result in the loss of a fair proportion of load. The net result is that that portion of the non-available boilers which lies above the load curve or load duration curve must be neglected, and the non-availability applied only to that section of the curve which falls within the capacity of the last boiler.

Referring to fig. 1, this means that if we have two 30-MW sets to carry the majority of the load, with an assessed availability of 90 per cent., then 100 per cent. of the base load would be carried by one set or the other, while the kWh carried on the second set would be calculated by multiplying the average availability (per cent.) by the number of boilers, and from this figure subtract 100 per cent. multiplied by the number of boilers assumed to be always on the range. This gives the true availability of the last boiler, which is multiplied by the ideal kWh available for it, to obtain the kWh output possible.

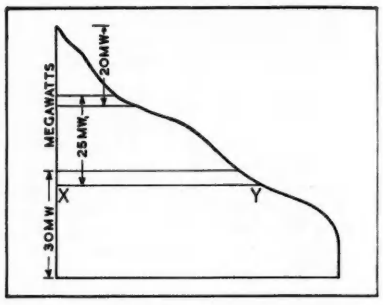


Fig. 3

Referring to fig. 2 and assuming each boiler is on the range for 90 per cent. of its time: $(3 \times 90$ per cent.$) - (2 \times 100$ per cent.$) = 70$ per cent. Thus 70 per cent. of the kWh ideally available for the last boiler should actually be generated, together with the whole area lying beneath the load curve within the capacity of Nos. 1 and 2 boilers, and ignoring the outages of these boilers.

In fig. 1, with a similar availability, we find that 80 per cent. of the area of A B D C together with 100 per cent. of the area C D H G should be generated on the two 30-MW sets. Any amount by which actual output falls short of this figure is accounted for by an operation ratio, and a check on station performance can be maintained by keeping the ratio as near 100 per cent. as possible.

The procedure is not so easy when sets and boilers of varying sizes and performances have to be included. The same principle is maintained, however, of withdrawing each piece of plant at the average load which it would ideally have had. In fig. 3 we have a load duration curve where the base load is dealt with by a 30-MW set. The availability of this set is applied to the ideal kWh beneath the line denoting its capacity, and the kWh possible for the set thus obtained. A line XY must then be drawn such that the area beneath it is equivalent to the kWh so calculated, and it is this line from which the capacity of the next set must be stepped off, in order to assess the ideal allocation of kWh. The availability of this set is similarly applied, *et seq.*, and the true kWh available compared with the actual kWh generated, or lb. of steam delivered from boilers, will give an operation factor for each piece of plant. In a normal instance only the first or possibly the first two sets will be of interest.

Electrification in Estonia

ALTHOUGH it will not be immediately remunerative the State utility company is carrying out electrical extensions in rural districts. In the south of the country twenty additional districts are to be dealt with this year and nine in the north. The company has imported large supplies of copper for the production of transmission lines by Estonian concerns.

SWEDISH ELECTRICAL TRADE

Production and Imports

By Sten Tennander, E.E., Djursholm, Sweden

SWEDEN has attained a high degree of electrification due to the ample water power resources available. About 87 per cent. of the energy generated is supplied by water power plants. The total output in 1937 was 7,946 million kWh, of which 27 million kWh was exported. The consumption per head of the population was 1,260 kWh.

According to estimates, the available water power resources of Sweden correspond to an energy production of 42.6 billion kWh per annum, whereas that portion of these resources which is economically utilisable, represents 6.5 million kWh or about 32.5 billion kWh per annum; the present production amounts to about 25 per cent. of that figure. Those water power sources which are not yet developed are chiefly situated in the northern regions of the country, rich in forests and sparsely populated.

PRODUCTION, IMPORTS AND EXPORTS

(Millions of Swedish kr.)

Class	1	2	3	4	5	6
Production	97.90	12.76	28.47	46.32	25.63	7.95
Imports:						
Germany	28.89	1.03	0.12	6.92	3.91	0.45
United States	5.28	0.02	0.16	0.13	3.17	0.19
Netherlands	1.29	0.11	—	0.09	6.41	—
Great Britain	2.03	0.04	0.18	0.13	2.07	0.22
Denmark	1.84	—	0.01	0.10	0.04	—
Belgium	0.12	—	—	0.74	0.35	—
Norway	0.09	—	—	0.13	0.14	—
France	0.26	—	—	—	0.02	—
Other countries	5.69	—	0.04	0.20	0.68	0.01
Exports:						
Finland	5.14	0.29	0.98	0.90	0.82	0.13
Norway	1.86	0.51	0.70	0.36	0.22	0.33
Brazil	1.14	1.38	0.50	0.19	0.01	0.06
Argentina	1.01	0.75	0.29	0.90	—	0.30
Great Britain	1.56	0.72	0.07	0.19	—	—
Belgium	1.40	0.92	—	—	0.02	0.05
Mexico	0.50	0.40	0.73	0.66	—	0.03
Australia	0.39	1.44	—	—	—	—
France	1.06	0.55	0.01	—	0.03	0.03
Netherlands	0.37	0.50	0.53	0.05	—	0.20
Germany	0.60	0.56	—	0.24	0.02	0.13
Poland	0.45	0.14	0.75	0.10	—	0.02
Denmark	0.80	0.20	0.27	—	—	0.07
Czechoslovakia	0.05	0.67	0.06	—	—	0.38
Other countries	10.77	3.04	2.62	2.26	0.36	0.32
Consumption	116.29	1.89	21.47	48.91	40.94	6.77

Even at the present time considerable amounts of energy are being transmitted from those regions to the more densely populated southern and central districts of Sweden, where the power sources are, practically speaking, completely developed. The most important trunk lines running in a north-south direction are operated at 220 kV. A large number of big water power stations and transmission plants are owned and operated by the Swedish State. The respective shares in 1937 (millions of kWh) of the various consumer groups in Sweden were as follows:—General supply systems in towns, including commercial uses, 935; traction, 596; large industrial motors, &c., 4,053; electro-chemical and electro-thermal uses, 1,168; industrial heating, especially steam generation, 238.

High consumption figures have been achieved in the domestic electrification field thanks to attractive rates and cleverly conducted publicity. It is estimated that the number of electric cookers at the present time installed in Sweden is about 60,000 and development is rapidly proceeding.

Railway electrification in Sweden has been carried out to such an extent that about 79 per cent. of the traffic volume of the State Railways is nowadays handled by electric locomotives.

Sweden possesses a highly developed electrotechnical industry whose products are renowned throughout the world. But in spite of this and the fact that there is an important electrical export trade, much electrical equipment is still being imported, such as electrical installation materials, meters, cables and other insulated conductors, incandescent lamps, radio sets, &c. The total amount of the annual production, importation, exportation, and consumption, as well as the shares of the respective countries and of the various classes of articles are shown in the table. These classes are as follows:—(1) Machines, transformers, meters, installation materials, incandescent lamps, &c.; (2) vacuum cleaners, floor-polishers; (3) telephone and telegraph equipment; (4) insulated conductors and cables; (5) wireless equipment; and (6) accumulators.

The great majority of foreign exporters are represented in Sweden by Swedish agents or firms. Two large German companies have established their own sales organisations in this country in the form of affiliated concerns. As may be seen from the table, imports of materials for power engineering are for the most part from Germany and only to a lesser degree from other countries. This is due mainly to the fact that in Sweden installation engineering has for a long time followed the same lines of development as in Germany, and adopted the same standards in respect of dimensions, &c.

Customs and Control

Electrical materials imported into Sweden are subject to customs duties to the amount of 15 per cent. of their value. No formal import restrictions exist in this field. Actually, however, the control exercised in this country over the quality of electrical materials has a certain restrictive effect, in so far as only tested and approved materials may be sold and used. This control, which is exerted by an institution authorised by the State, Svenska Elektriska Materielkontrollanstalten (Swedish Bureau for Testing Electrical Materials), is so far obligatory only for radio receiving sets, mains condensers, and sound transmitters, but it will soon be expanded to include rubber-insulated conductors, installation materials, and such electrical appliances—*e.g.*, vacuum cleaners, heating devices, &c.—as are handled by persons not possessing any electrical training. These categories have for many years been subject to voluntary control.

Among the most important bodies in the Swedish electrical world may be mentioned the Association of Swedish Electricity Undertakings, which unites State, municipal and private systems; the Association of Swedish Electrotechnical Industries; and the Association of Swedish Electrical Contractors. These bodies, together with some other professional organisations, have formed a propaganda centre called FERA (Association for the Rational Use of Electricity) which promotes the use of electricity for domestic, commercial and industrial purposes. Standardisation in the electrotechnical field is dealt with by the Swedish Electrical Commission in which the State is strongly represented. Control of electrical installations is exercised by the State Electrical Inspection and the Electrical Department of the Board of Trade which issues regulations for installations and rules for testing electrical materials.

London J.E.A.

THE following is a statement of the bulk supplies given to authorised undertakings by the London and Home Counties Joint Electricity Authority during the calendar years 1938 and 1939:—

Undertaking	Total net bus-bar kWh. (millions)		Percentage increase or decrease	Net bus-bar m.d.		Percentage increase or decrease
	1938	1939		1938	1939	
Walton-on-Thames	12.0	13.3	+10.7	4,445	4,328	— 2.6
Hornsey	22.5	20.9	— 7.1	11,069	9,672	—12.6
Epsom	12.5	12.6	+ .04	4,315	4,055	— 6.0
Hammersmith	86.1	89.1	+ 3.5	27,064	26,580	— 1.8
Reigate	10.8	11.3	+ 4.4	4,870	4,040	—17.0
Leatherhead	13.4	14.9	+11.4	6,315	5,300	—16.1
Barnes	20.9	20.4	— 2.7	7,850	7,290	— 7.1
Islington	67.5	65.9	— 2.4	28,060	26,560	— 5.3
Finchley	33.6	33.2	— 1.3	14,986	13,133	—12.4
Dorking	8.1	8.7	+ 6.8	3,105	3,060	— 1.4
Richmond	15.4	14.9	— 2.9	5,735	5,575	— 2.8
Kingston	24.0	24.3	+ 1.5	8,565	8,000	— 6.6
Twickenham, &c.	73.1	73.9	+ 1.1	26,861	25,579	— 4.8
East Ham	34.3	36.5	+ 6.4	12,350	11,830	— 4.2
Woking	28.4	33.1	+16.5	10,540	9,300	—11.7
Wimbledon	86.6	85.2	— 1.6	36,806	29,266	—20.5
Guildford	18.0	25.3	+40.0†	8,960	11,100	+23.9
Totals	567.3	583.4	+ 2.8	221,896	204,668	— 7.8

† Guildford agreement is for partial bulk supply.

HIGH MAXIMUM DEMAND.—It was reported to the Authority last week that, due to the exceedingly low temperatures prevailing, the total maximum demand of the local distribution areas which occurred on Sunday, January 21st, exceeded that provided for in the estimates for the current year by 16,142 kW. This, as far as can be estimated at the present time, will result in an additional cost to the Authority of £44,390. A complete report is to be submitted to the Authority on the matter.

ELECTION OF MEMBERS.—The London and Home Counties Electricity District Order, 1925, provides that all members of the Authority shall go out of office on December 2nd next. The regulations governing the appointment and election of members of the Authority provide for the compilation of registers of the voting power of electing bodies before the end of this month. Particulars are being obtained from the constituent authorities to enable the registers to be completed.

NEON SIGN CONTRACTS

Position under the Lighting Restrictions

By E. P. Hollis, B.Sc.

PROHIBITION by the Defence Regulations of the lighting of neon signs in exposed positions has caused considerable exercise of mind amongst users of signs under instalment sale contracts, and to a greater extent amongst their unfortunate guarantors and insurers. Human nature revolts against paying for services not rendered, and it is evident from the number of agreements put before me for examination that a feeling is abroad that, in equity, any loss should be shared equally by manufacturer and user.

A feature of these contracts, peculiar to neon signs, is that the price is a composite undivided figure, embodying not only an item in respect of the use or purchase of the sign, but one for its maintenance, no express allocation in respect of each item being made. In measuring the damages due on default no court would consider a proposal that it should create such an allocation. Since 1647 the courts have steadfastly refused to make contracts between parties which they could have, and have not, made for themselves.

Four forms of contract have to be considered: hire, hire-purchase, conditional sale (see ELECTRICAL REVIEW, January 6th and March 5th, 1939), and absolute sale. Instalment sale practitioners are hardened to surprises. But it is really astonishing to find that thousands of neon signs—of all things—are comprised in hire agreements. A sign is usually something a manufacturer has specially to create, and it is almost valueless to him if returned. So that there can be no justification for the slightest difference in price (apart from credit charges) between a contract of hire of a specially created sign and any other form of agreement. That a user can be induced to enter upon such a contract knowing that at the end of the three years, when he must have paid the full value of the sign, he has no more interest in it than at the beginning, passes understanding, and his passive acceptance can, in many cases, only be attributed to an incomplete realisation of the nature of the contract he is signing. This may lead to a plea of lack of mutuality of contract as a successful defence to a claim. As a matter of fact there has been, for obvious reasons, a strong tendency in recent years to avoid all forms of bailment agreement and adopt absolute sale.

Why Hiring Agreements?

In search of a motive, one can hardly consider this unfortunate selection of a hiring agreement avoids the Hire-Purchase Act (although this method of avoiding the restrictions of the Act is being adopted, not always successfully, by agreement draftsmen whose impoverishment of ingenuity can suggest no other way out of their difficulties), as these hiring agreements are used for transactions above Act values as well as those within the Act.

It may well be that the manufacturer's salesmen have used the agreement form as an inducement to buy their goods. "Ours is a hiring agreement," they may have said, "and your rents can be charged against expenses, whilst our competitor's are hire-purchase agreements, and the instalments are chargeable against capital. By having our sign you save 7s. 6d. in the pound income tax. We will not take it back at the end. Of what use would it be to us?" In this connection, a decision by Judge Earengey at the Clerkenwell County Court on February 29th last is of interest. A radio "rental" agreement provided that the user should rent the radio for a period, after which the owner would not exercise his proprietary rights. His Honour held this to be a hire-purchase agreement, as it most obviously was.

The difference between this and the sign agreements under consideration is that in the radio agreement the owner's undertaking not to exercise his proprietary rights is expressed, whereas in the sign agreement it is implied, or may have been expressed verbally in the negotiations. If the owner intends not to remove on completion of the hiring, the goods must obviously become the property of the hirer, and the agreement will conform to the definition of a hire-purchase agreement contained in the Act, as well as that in the Finance Act, 1907, s.7. If a court should find such an agreement, being within Act values, to be a hire-purchase agreement, it will be void (subject to relief by the court) since it does not include the notice required by the Act.

Whatever be the motive, the fact is that large numbers of signs are hired, and this form of contract is here dealt with first because it corresponds most closely to one considered by the Court of Appeal in 1916 (Leiston Gas. Co. *v.* Leiston-cum-Sizewell U.D.C. (1916) 2 K.B. 428). The Gas Company had contracted with the Council to erect a number of street lamps, the property in which was not to pass; to supply the gas; and to maintain them for a long period of years commencing in 1911. Payments were to be made quarterly and, consequent upon the Defence Regulations prohibiting the lighting of the lamps, the Council defaulted and was sued by the Company. In defence, it pleaded that performance of the contract had been frustrated by the Regulations, and it was therefore at an end. But the court pointed out that the Gas Company, at the time of breach, had largely performed this contract. It had provided the lamps; given service for several years; and was at all times willing to continue to do so. The Defence Regulations might be changed and the lamps could then be lit. The Council was therefore ordered to make its payments in full. The parallel with the present neon situation is almost exact.

As many contracts include a clause extending the period of the agreement if the sign should fail to light from "any cause whatever," the case of Wycombe Borough Electric Light Co. *v.* Chipping Wycombe Corporation (33 T.L.R. 489) is also of interest. Here it was held that when the contract spoke of failure to light the lamps from "any cause whatever" it meant any cause within the control of the Electric Light Company.

Regulations Do Not Alter Contracts

The position is therefore that the Regulations do not in any way interfere with the legal effect of these hiring contracts and a hirer in search of relief must find some other ground than frustration. This rule extends to all other forms of instalment sale contracts in orthodox form. Nevertheless, the hiring manufacturers are displaying great anxiety to divest themselves of the property rights, and in the hope of converting the contract to absolute sale are making offers to the hirers to sell the sign.

An indirect effect, however, has been a diligent search by disgruntled users for ways of reducing their liability if they return a bailed sign. But, as these notes are only intended to explore the direct situation created by the Regulations, these termination-of-bailment problems can only be given brief mention. They are important, difficult—in view of the special nature of the contracts—and as yet almost wholly unexamined. Fresh probings of the situation are being made daily. For instance, it has been inquired whether the "all to become due in the event of default" clause of many sign hiring agreements is a penalty. It is not.

Conditional Instalment Sales

Whilst buyers under absolute sale agreements, hirers under hiring agreements, and intending buyers under conditional instalment sale agreements are offered no easy method of relief, direct or indirect, from the situation, hire-purchasers under hire-purchase agreements in Helby *v.* Matthews form (and the Modern Light Cars *v.* Seals variation of it) may be in a happy position if the minimum payment clause extends only to 50 per cent. (though this observation would not apply to a Belsize Motors *v.* Cox form, which is a fixed term agreement) and the return of the sign with, maybe, one-half of the contract hire unpaid, and no further liability on the hire-purchaser, may bring home to the manufacturers the great unwisdom of hire-purchase and lead them to examine the merits of conditional instalment sale agreements. These, being based upon the solid foundations of the Sale of Goods Act, instead of the shifting sands of that legal fiction hire-purchase, stand the test of such a difficult occasion as this and save the manufacturer from loss.

At the same time, it should be realised that any bailment agreement (be it hire, hire-purchase or conditional sale) may expose the manufacturer to a claim that, by reason of the degree of affixation of the sign making it a fixture (the justification of such claim being dependent upon the facts) the licence to seize given in the agreement converts the document into a bill of sale, and to quote the words of Roche J. in Modern Light Cars *v.* Seals, "If it be a bill of sale, then, as it is unregistered, it is void, and everything it purports to effect is bad."

INSTITUTION PROCEEDINGS

Mains Frequency Error. Oil-less Metal-clad Switchgear. Radio Relay Considerations. Water-tube Steam Boiler Design.

Frequency Error Measurement

METHODS of measuring and recording the frequency error of 50-cycle AC derived from public mains are described in detail in a paper compiled by Mr. F. O. Morrell which was read before the Meter and Instrument Section of the Institution of Electrical Engineers in London on March 1st.

The design of the recorder employed and much of the original work described were due to the late Mr. G. R. Oman, with whom the author was associated at the Post Office Research Station at Dollis Hill. This investigation indicated that synchronous motor drive should be quite satisfactory for teleprinters; in fact, it would probably be better than the governed DC motors at present used for this purpose. Continuity of operation in emergency must be provided for, but in more normal times AC mains drive would undoubtedly result in considerable economics. For 99 per cent. of the operating time the mains frequency error would not exceed 0.45 per cent. A speed tolerance of ±0.75 per cent. had been established for these machines by the Comité Consultatif International Télégraphique. But it was not practicable to employ AC mains drive for the multi-frequency motor generator sets used for voice-frequency multi-channel telegraphy. In this case the 0.25 per cent. limit permissible in carrier frequency (and therefore driving motor speed) error would be exceeded for more than 15 per cent. of the operating time.

Method of Recording Error

Mains frequency error was recorded by comparison with a high-grade standard, by heterodyning the 1,000-cycle output with the twentieth harmonic of the 50-cycle input, after rectification; counting by meters the number of beats so produced in five seconds made the instrument accuracy within 0.02 cycle per second. Schematic and circuit diagrams of the recorder were included in the paper.

Step diagrams illustrated the distribution of frequency error; for example, 26.63 per cent. of the readings were recorded on the first meter, indicating an error of less than 0.05 per cent., while 58.83 per cent. on the first two meters indicated less than 0.1 per cent. and so on. The standard deviation of the normal-error curve (namely, its RMS value) was computed to be 0.114 per cent., or 0.115 per cent. after an interval of nearly one year. The percentage of readings of small errors was below the curve and that of large errors above. The reason for this was not quite clear, though greater variations of load and frequency experienced by day than at night might be a partial explanation. Meter and chart records confirmed the expectation that both the extent of the power distribution system and the rate of change of load influenced the magnitude of frequency variations.

While slight changes of frequency could be noticed during the counting periods they were not large enough seriously to affect the accuracy of the instrument.

Switchgear Design

OIL-LESS metal-clad switchgear for three-phase AC up to 660 V was described in the paper by Messrs. H. E. Cox and L. Drucquer (British Thomson-Houston Co., Ltd.), which was read at the Institution of Electrical Engineers in London on March 7th.

A rating of 25 MVA at 400 V meant short-circuit values approximating to 35,000 A (RMS) compared with 5,000 A in the case of a 2,500-MVA breaker at 280 kV. Thus the smaller switch had to deal with seven times the fault current, which was capable of exerting fifty times the mechanical stresses. Loading ranged from 5 to 4,000 A, but breaking performance varied very little between 220 and 660 V. The authors regarded the upper short-circuit limit as approximating to 44,000 A (symmetrical RMS) and therefore contended that rather than install switches capable of dealing with more than 50 MVA at up to 660 V it would be more economical to limit fault currents by sub-division of the sources of supply.

Air-break switches were recommended for medium voltages, an analysis of requirements (compared with DC) showing that for AC operating mechanism and contact parts must be more robust, but the blow-out structure could be relatively small and simple; test data indicated that magnetic blow-out coils were not needed. The best form of contacts to satisfy all requirements were said to be the butt (or contactor) type. Tested modifications showed that burning and welding could be serious with 15,000 A (peak) so that it would be more economical to resort to multiple contacts for more than 25,000 A when intended to close on to short-circuits and latch home, *i.e.*, when fitted with delayed or relay tripping devices, though for instantaneous tripping it was possible to rate a single contact up to 50,000 A (peak).

Performance tests had indicated that for the same amount of air-break contact erosion an oil breaker could only perform from one-twentieth to one-fiftieth the number of operations when controlling rolling-mill motors and similar duties.

The paper ended with references to switch-fuse mechanisms and assembly into various combinations for building-up complete metal-clad switchboards. Gas barriers between bus-bar chambers of adjacent equipments were essential to prevent arcs spreading. To disperse gas products, spring-loaded pressure-relief vents in the tops of circuit-breaker compartments had proved to be extremely satisfactory under actual full-scale tests. The complete absence of oil reduced the fire hazard.

Wire Broadcasting

GENERAL principles underlying the design of underground cable networks for distributing broadcast radio programmes were set out in a paper by Dr. T. Walmsley (G.P.O., wire broadcasting branch) which was read before the Wireless Section of the Institution of Electrical Engineers in London on March 6th.

The author stated that when conditions became more favourable there would be reason to expect a considerable extension of this means of reception in Britain, where at present only about 3 per cent. of listeners received their programmes by wire. In Holland over 50 per cent. used wire networks, in Switzerland 16 per cent., and Germany was said to have plans for serving ten million listeners by means of carrier currents over the telephone network.

Broadcasting by wire was freer from interference of various sorts and not subject to the audio band-width limitation suffered by radio emissions in a frequency-congested medium. The assumption that it must necessarily be dearer than direct wireless reception might be misleading. The author's figures indicated that the inveterate listener, satisfied with two programmes, would find an audio-wire system cheaper, while the occasional listener would be better suited from the cost aspect by a direct radio service.

Audio-frequency Systems

Part I of the paper differentiated between the several available audio-frequency systems of relaying; alternative means of remotely selecting programmes by relays or push-button impulsing; and the control by distant switching of amplifying sub-stations by uniselectors and automatic telephone technique. For the remote control of receiving stations various schemes had been evolved and several tested out; circuit diagrams illustrated the use of multi receivers with selective filter switching as in conventional automatic telephone working, modified press-button selection principles and the utilisation of a variable-carrier-frequency transmitter over the connecting line between control and receiving stations.

The selection of underground cables required careful consideration. When ducts could be shared with other services the mutual economic advantages might be very appreciable; in fact, the difference between the annual charges on overhead and underground feeders might become negligible. Particulars were included of lead-covered four-pair cables which tests had shown to be suitable. An average peak of 120 V with occasionally much larger ones were visualised, which would necessitate a large step-down in voltage before connection to subscribers' loudspeakers. The latter were described as the weakest link in the chain of equipment, but it was claimed that a marked improvement in their design had been made by P.O. engineers (see ELECTRICAL REVIEW, December 15th, 1939, p. 761).

Part II of the paper was concerned with rediffusion at carrier frequencies. The chief advantage of this method was attributed by the author to the fact that far more premises were connected to electricity supply than to telephone networks. But the utilisation of telephone cables would enable subscribers' lines to be energised as and when required, fewer carrier amplifiers would be needed, noise arising from terminal equip-

ment could be reduced to small dimensions by inexpensive filters, and considerable power could be saved owing both to lesser line attenuation and to lower noise voltage.

A large number of tests on several sub-station distribution systems had indicated (with certain reservations) that if a carrier input of 10 W (corresponding to 11 V) were provided at the sub-stations in question, then a signal-to-noise ratio of 40 db at the entry to the consumer's premises would have been obtained in 93 per cent. of the cases, the carrier power available being roughly 16 mW per consumer, who numbered 612 per sub-station. The carrier power was much greater than was needed when telephone pairs were used and, moreover, average values were not a criterion of satisfactory service. Provided that line noise was not the limiting factor, the signal carrier power required at the line terminal equipment to which the receiver was connected was less than 1 μW. Twenty-five times as much power was necessary to overcome the greater unwanted pick-up of overhead open-wire lines.

Computation in hypothetical cases showed that power requirements compared very favourably with those for purely radio transmission. Although from the point of view of economy of energy the single-side-band suppressed carrier system had advantages, its adoption would require a special receiver, resulting in greater expense and complication. The use of ordinary broadcast receivers for both radio and carrier services had some advantages, though it would limit the choice of carrier frequencies.

Metallurgical Studies

FURTHER results of research, some of which has been in progress for some time, are contained in a series of papers released by the Institute of Metals. Several of them are concerned with the constitution and properties of copper-rich alloys.

Dr. L. Northcott (Woolwich Arsenal) has examined the influence of eight alloying elements on crystallisation, while at the Witton works of I.C.I. Metals, Ltd., Dr. W. O. Alexander has investigated the effect of heat treatment on microstructure (hardening), and Drs. M. Cook and T. Ll. Richards have studied by both X-rays and microscopic methods the structural changes brought about by cold rolling down to 97 per cent. reduction of thickness and of corresponding strip material after annealing.

When copper containing free oxide is maintained at high temperature a rapid growth of the cuprous oxide particles occurs, indicating that oxygen is able to diffuse through the metal at a very appreciable rate. An attempt to provide quantitative data is made in a paper by Mr. C. E. Ransley (G.E.C., Wembley), which shows that the desorption of oxygen from copper *in vacuo* is controlled by the rate of evaporation from the surface, not by diffusion from the interior of the metal. Carbon monoxide does not diffuse into solid copper; when the latter is heated in the former any oxygen it contains is removed by a surface reaction, the velocity of which is limited by the rate of diffusion of oxygen to the surface. The results given in this paper indicate that copper may be completely deoxidised without impairment of its mechanical properties by treatment in carbon monoxide that is free from hydrogen, since it is penetration of the latter which causes the embrittlement of copper in reducing atmospheres.

It is not easy to guard against contamination when filings are being made for the study of metals by X-ray powder photography. In a paper by Drs. G. V. Raynor (Keble College, Oxford) and W. Hume-Rothery (Royal Society Warren Research Fellow, Oxford) apparatus is described for preparing metallic filings in an atmosphere of argon and then sieved and sealed into silica capillary tubes without exposure to the atmosphere. In this way the authors have been enabled to measure the lattice spacings of magnesium accurately at high temperatures and to determine the coefficients of expansion parallel and perpendicular to the hexagonal axis.

A paper by Dr. A. L. Norbury (British Cast Iron Research Association) discusses an empirical inter-metallic phase relationship which has enabled a theory to be developed that certain lattice types form subsidiary lattices of the same basic type by a process of atoms replacing electrons, or *vice versa*, without altering the total number of atoms plus electrons in the lattice, but changing the electron-to-atom ratio and so degrading the symmetry. It is suggested that the ordered process is due to energy exchange between atomic electron shells and free electrons, tending to make them equivalent and interchangeable, the disordered process being similarly due to energy exchange between electron shells of solvent and solute atoms.

Of the 850 papers read before this Institute, 17 per cent. have dealt with aluminium and its alloys. The production in Great Britain of this metal is described in the Institute's seventeenth autumn lecture, which has been prepared by Mr. W. Murray Morrison and is largely a history of the British Aluminium Co., Ltd., of which the author is managing director and with which Lord Kelvin was closely associated.

Brief outlines of the raw materials employed and the electrolytic method of reducing the ore, with the aid of DC generated by water power for cheapness, are followed by descriptions of hydro-electric developments at Foyers in Inverness-shire, where production commenced in 1896, at Kinlochleven in Argyllshire, in 1907, and at Lochaber in Inverness-shire, in 1929, together with references to the Grampian scheme of the Scottish Power Co., Ltd., and to further proposals for other water-power developments in the Highlands.

Salts of aluminium are more widely distributed in nature than those of any other metal; about a twelfth part of the earth's surface is computed to consist of chemically combined aluminium, but economical extraction is limited to a few ores because of the costliness of separating unwanted constituents. About 24,000 kWh is required in all to produce one ton of the metal, or 2.75 kW continuously for one year. World production rose from 40 tons in 1886 to 600,000 tons in 1938, of which Germany produced 180,000 tons, U.S.A. 128,000 tons, Canada 65,000 tons, France 44,000 tons and more recently Russia and Japan 70,000 tons.

The British Aluminium Co. was a pioneer at home as well as in Norway, where it has large interests, in addition to several factories for prior and subsequent processing in other parts of Great Britain, besides the three Highland works. It claims to be the first producer to adopt large furnaces; the original ones at Foyers each passed 8,000 A, while those at Lochaber pass 40,000 A each, and the number operating in series has been increased so that 350 V (the nine original DC generators, which are still in use, each produced 8,000 A at 65 V) is now the highest used by the British Aluminium Co., which also claims to have pioneered in the experimental use of the Soderberg type of furnace. This enables the electrodes to be formed by feeding ground carbon mixed with pitch and tar binders into single anode containers suspended above the furnaces. Their baking is thus effected by the passage of the current and the heat radiated by the furnaces, so obviating the costly pressing and baking operations formerly done in separate electrode factories.

The effect of the last war was to more than double the world production, from 70,000 tons in 1913 to 150,000 tons in 1919. What influence may present hostilities have upon the utility of this light-weight metal?

Steam Boiler Simplification

IN a paper read at an extra meeting, arranged by the Steam Group, of the Institution of Mechanical Engineers in London on March 1st, simplification of water-tube steam boiler design was urged.

The authors were Messrs. W. Yorath Lewis (formerly managing director, British Niclausse Boiler Co., Ltd.) and Struan A. Robertson (Battersea Polytechnic, London), who maintained that weight, space and complications might be lessened, efficiency and reliability improved, and frequency and duration of shut-down and soot-blowing periods reduced if designers could be provided with a rational theory of circulation. In Part I of the paper the nature of the change from water to steam was studied in order to establish a basis for later calculations. Recent investigations in America and on the Continent were referred to as well as the authors' own experiments.

Part II suggested the establishment of a simple type, consisting of a single drum and a single U-tube, as a standard of excellence with which other boilers might be compared qualitatively. Flow calculation was claimed to prove such a simple device to be satisfactory, provided that the downcomer leg of the U-tube was not heated.

Part III was intended to demonstrate how departures from the proposed simple standard U-tube (such as those met with in practice, including the use of several tubes, downward discharge of the steam, use of bottom drums, so-called "high-head" boilers and long tubes needing forced circulation) all produced effects that were disadvantageous.

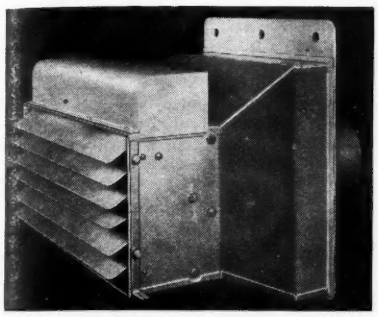
An improved type of tube that approached very nearly the suggested standard U-tube had been evolved by the authors, who claimed to have proved its circulation to be adequate over the full range of pressures and highest possible rates of heating. The new kind of tube was said to enable a much simplified boiler to be designed. The assured excellence of circulation, especially in the rear tubes, allowed full advantages to be obtained from the use of higher gas speeds, and greater heat transmission rates, with consequent important reductions in the area of heating surface required. Other rational eliminations and improvements were also rendered possible, which enabled substantial reductions to be made in the cost of manufacturing, installing and maintaining boilers.

ELECTRIC UNIT HEATERS

Flexible and Economic System

By E. Eaves

FOR many years the merits of the unit heater system has been recognised for the heating of factories, workshops, stores and the like, and there are a large number of such installations in the country with steam or hot water as the heating medium. It is not so fully realised, however, that there is a big field for electric unit heaters, particularly where electricity prices are low or where special rates are available for supplies clear of the peak between, say, 4.30 and 6.30 p.m. It is often permissible to switch off heat at 4.30 p.m. without appreciably affecting the comfort conditions. The term "unit heater," as generally used in the heating trade, may appear to be a misnomer, as it implies a central source of supply of the heating medium. It is considered, however, that the term should be allowed to persist, particularly in the case of the electrical type, where the heat is generated at the point of dissipation, that is in the unit heater itself, thus eliminating all heat transmission losses.



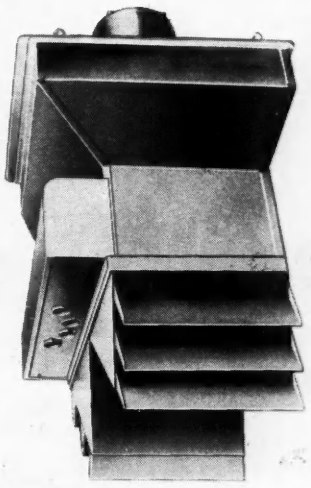
G.E.C. unit heater

Advantages of an electric unit heater system are that it can be installed in a much shorter time than perhaps any other and at a lower capital cost; it avoids the capital cost of a central boiler house and leaves the space available for other purposes; and it involves no operation labour charges, and inappreciable maintenance charges The electric unit heater system in general has the great aavantage, compared with other systems, that it provides perhaps the only efficient method of heating in which no floor or working space is occupied by the heaters.

Ideal working conditions are obtained, as the warm air is projected to and diffused over the working level and is kept in continual circulation. Also, due to this movement of air, natural ventilation is assisted, and working conditions in the summer can be greatly improved by operating the fans without the heaters, at a negligible running cost. In urgent works or factory extensions the method may be used in preference to incurring the capital cost of extending the existing central boiler house. This applies particularly where an extension may be remote from an existing central system.

Though manual switch control may be employed, a considerable saving in cost of running can be obtained through employing thermostatic control at a small increase in capital cost. Most normal requirements can be met by heaters incorporating 12 in. fans and loaded at 5 and 10 kW or incorporating 15 in. fans and loaded at 15 and 20 kW, with convenient mounting heights of up to, say, 12 ft., whether from wall, girder or stanchion. Correct projection of the warm air to working level is obtained by means of adjustable louvres and diffusion is greatly assisted by having the width of the outlet twice that of the height. Larger sizes can be made up for higher loadings and greater mounting heights to 40 ft.

Internal baffles in horizontal unit heaters minimise rotation of the air and thus eliminate the risk of a vortex, resulting in uniform operation of the heating element over its full surface and preventing the inclusion of streams of cool air with the warm air projected from the heater. This feature, together with the proportioning of fan speeds and electrical loadings, ensures that the open-coil heating elements run at uniform black heat without any tendency towards hot spots, and the unit operates noiselessly.



Heater for high mounting with a diffuser by Multi-Ray Heaters, Ltd

In calculating the loading for any particular scheme, a temperature difference of from 20 to 25 deg. F. is usually taken for stores, workshops and garages rather than the 30 to 35 deg. employed for offices, factories, and the like wher ethe work is of a sedentary nature. The unit heaters should be so installed that there is a resultant circulation of air around the room. Within limits decided by capital cost, it is advisable to employ a number of smaller units rather than one or two very large ones, as this results in uniformity of heating over the area, and, owing to greater flexibility, a reduction in cost of running.

E.D.A. Luncheons

ABOUT ninety representatives of the member undertakings of the E.D.A. North-West England and North Wales Area Committee attended the annual informal luncheon held prior to the eleventh annual meeting at the Midland Hotel, Manchester, on February 27th. Mr. W. S. Johnston (St. Helens), the retiring chairman of the Committee, presided. Mr. A. Nichols Moore (chairman of E.D.A. Council) and Mr. A. C. Cramb (director and secretary) briefly outlined the activities of the Association, particularly since the outbreak of war.

The annual report of the Area Committee mentions that membership in the area now totals seventy-nine, including three joint electricity boards, twelve company undertakings and sixty-four municipal undertakings. The Committee has endeavoured to carry on normal activities as far as possible in spite of the changed circumstances. New showrooms or offices have been opened during the year by the Blackburn Corporation, Holyhead U.D.C., Liverpool Corporation and the Newton-le-Willows U.D.C. The Isle of Man E.D.A. Circle continues to function.

Mr. A. J. Hutchinson was elected chairman and Council representative in succession to Mr. W. S. Johnston, and Mr. J. E. Nelson was elected deputy chairman and deputy Council representative. Mr. B. Kelly (Douglas, I.O.M.) was again appointed a co-opted member. Minor changes were made in the personnel of the Area Committee.

The annual luncheon of the Mid-East England Area of the Association was held at the Queen's Hotel, Leeds, on February 29th. In proposing the toast of "The Electrical Industry," Sir Eugene Ramsden, M.P., said that electrical products had gradually become one of our most important exports. The importance of electrical manufactures in the list of exports could be judged by the fact that in 1938 exports totalled just over £23 million, a record for all time. For the time being Germany was out of the picture and could not compete in the markets of the world, but on the other hand, America and other nations were making every effort to obtain the trade which had been lost by Germany. To bring this trade here would involve strenuous efforts on our part.

The chairman of the E.D.A. Council, Mr. A. Nichols Moore, said that among the spheres of electrical development given added significance by the war was the opportunity for extending the use of the electric battery vehicle, which was independent of imported fuel supplies. If there were 100,000 of these vehicles on our roads—that being the number of petrol vehicles which it was thought could be replaced to advantage—a saving of 70 million gallons of petrol a year would be achieved. E.D.A., in co-operation with the Electric Vehicle Committee, was successfully bringing this before the public. The Association was also able to help the Government and the electricity supply industry by encouraging the use of electricity to help to increase food production. The Lord Mayor of Leeds (Mr. C. H. Boyle) welcomed the Association, and other speakers were the vice-chancellor of the University of Leeds (Mr. D. Mouat Jones) and Mr. C. A. Goodall (chairman, Leeds Electricity Committee). Mr. R. O. Saville, chairman of the Area Committee, presided.

PERSONAL AND SOCIAL

Information regarding new appointments and other matters of interest for this page are welcomed

THE annual dinner and dance of the West Yorkshire Branch of the Electrical Contractors' Association was held at the Hotel Metropole, Leeds, on February 23rd, about 200 guests attending. The profits from the function are to be handed over to the Lord Mayor of Leeds Comforts Fund. A prize draw was also held during the evening, over thirty prizes being given by local branches of electrical manufacturers, wholesalers and members of the E.C.A. As a result the profits from the dinner and dance will be augmented by £28 12s. and it is expected that the Comforts Fund will benefit to the extent of £40. **Mr. J. Innes** presided and many representatives of electrical manufacturing and wholesaling firms were present. The Leeds College of Technology was represented by Mr. J. H. Everett, B.Sc., with Dr. E. Walton. The principal guest of the evening was Mr. F. Nichols, city electrical engineer of Leeds, who proposed the toast of "The Electrical Contractors' and Allied Associations." Mr. J. D. Green, chairman of the E.C.A. Northern Counties Sectional Board, responded.

Capt. Euan Wallace, the Minister of Transport, is to be the principal guest at the E.D.A. annual luncheon at the Savoy Hotel next Friday, March 15th.

Mr. C. C. Roloff, who has been for the last twelve years with the A.E.G. Electric Co., Ltd., London, and was until recently lamp sales manager of that company, has joined the lamp Department of the Metropolitan-Vickers Electrical Co., Ltd., to take charge of the projection and floodlighting section. Mr. Roloff has had wide experience, including Continental practice, in the technique of manufacture and application of projector lamps.

Mr. C. C. Roloff

Mr. W. G. Turnbull, at present with the Baird & Dalmellington Iron & Coal Co., Ayrshire, has been appointed chief electrical engineer to the Staveley Coal and Iron Co., Ltd., Derbyshire.

Mr. Asa Binns, M.I.Mech.E., who until recently was chief engineer of the Port of London Authority and is now connected with Rendel, Palmer and Tritton, consulting engineers, has been elected president of the Institution of Mechanical Engineers for the year 1940.

Mr. A. G. Connell, the new electrical engineer and manager to the Halifax Corporation, is to take up his appointment on March 14th. He has been presented with a silver cigar box as a memento of his service at Staveley, and has also received a silver toast rack for his wife.

Major Herbert Bell, M.I.E.E., .B.E., T.D., general manager of the Glasgow Corporation Electricity Department, who as we reported in our last issue is resigning from that position owing to ill-health, will retire on May 31st and has been granted leave of absence until that date. Mr. Bell has been general manager at Glasgow for twelve years. He was previously general manager of the Hull Corporation electricity undertaking for twenty years (exclusive of service in the last war) and was responsible for the development of the undertaking on both its commercial and engineering sides. He has also had a wide experience of the electrical aspect of dock and railway development, the complete electrification of the King George Dock of the L.N.E.R. being conducted by him in conjunction with the dock engineer of that period. The electrical requirements of the heavy industries have also come within his scope and he has had experience of contemporary electrical practice in other countries, especially in Canada and the United States.

Mr. R. F. Burston, A.M.I.E.E., who as we reported in our last issue has been appointed assistant mains superintendent with the Greenock Corporation Electricity Department, was at one time mains assistant with the Wolverhampton Corporation Electricity Department, and not mains superintendent as stated by us.

Mr. R. W. Sorensen, professor of electrical engineering and head of the department of electrical engineering at the California Institute of Technology, Pasadena, has been nominated for the presidency of the American Institute of Electrical Engineers. Mr. Sorensen commenced his career with the American General Electric Co., in 1905, and began his academic duties in 1910 as associate professor of electrical engineering at the Throop Polytechnic Institute (now the California Institute of Technology). In 1911 he was made professor and has since been head of the department of electrical engineering. In addition Mr. Sorensen has been engaged in consulting practice, having been engaged by the Pacific Light and Power Corporation, and the U.S. Electrical Manufacturing Co. In association with Dr. R. A. Millikan, he developed and patented a vacuum type of circuit breaker and during 1929-30 he was engaged in special work on this device in the laboratories of the American General Electric Co.

Mr. S. I. Ellis, engineer of the Lighting and Heating Department of the North-Eastern Electric Supply Co., Ltd., has been elected chairman of the Northern Counties Area Committee of E.D.A. for 1940-41.

During the recent two-day conference of distributors and dealers of Morrison-Electrics & Electricars, the directors of Associated Electric Vehicle Manufacturers, Ltd., entertained the members to lunch, together with representatives of the chief organisations supplying main components to A. E. Morrison & Sons, Ltd., and Electricars, Ltd.

Mr. Campbell Miller, accounts superintendent of Glasgow Corporation Electricity Department, was presented with a radio set and an electric standard lamp on February 29th, on his retirement. Mr. G. Morgan, assistant manager, presided, and the presentation was made by Mr. A. M. Estcourt, secretary and treasurer of the Department. Mr. Miller was appointed to the Electricity Department in 1896.

Mr. E. W. Hill, M.I.E.E., general sales manager of Aron Electricity Meter, Ltd., has resumed his duties after a serious operation from which he has made a good recovery. Mr. Hill expresses his appreciation and thanks to the many friends who have from time to time made inquiries as to his welfare and progress.

Obituary

Mr. W. Clark.—A former chief engineer of the Glasgow Corporation Tramways Department, Mr. Wm. Clark, has died at Glasgow. He had also been manager of the Lisbon Electric Tramways. He was appointed chief engineer of Glasgow tramways in 1892, and before the Corporation decided to run electric tramcars Mr. Clark and Mr. J. Young, who was then the general manager, visited America and Europe to inspect the latest electric traction systems. Before going to Lisbon Mr. Clark spent nearly all his business life in Glasgow, having served in several large engineering establishments in the city. He designed both the horse and electric cars in Glasgow, and had under his charge the large workshops of the Transport Department at Coplawhill and the Pinkston power station.

Mr. R. F. Laurence.—We regret to announce the death of Mr. R. F. Laurence, the senior sales engineer representative of Holophane, Ltd., which has occurred at a nursing home in Bristol. Mr. Laurence was in charge of the West of England territory of the company for over twenty years. He was known to all electrical people in the West Country where his reputation as an expert on lighting brought him into contact with large numbers of lighting engineers. Originally a member of the teaching profession which he left to join Holophane, Ltd., he remained with the company until his retirement over four years ago.

Mr. E. A. Evans, who has died in Quebec at the age of 84, was responsible for the construction of the electric street railway system in Quebec. In 1897 he was appointed general manager and chief engineer of this and also of the Quebec, Montmorency and Charlevoix Railway and the Montmorency Electric Power Co., all now forming part of the Quebec Power Co. In 1910 he went into private practice as a consulting engineer. He was born in England and was educated at the Royal Naval College, Portsmouth, and King's College, London.

Mr. R. G. Scott.—The death has occurred, in Edinburgh, at the age of sixty-nine, of Mr. Robert Grigor Scott, Loanhead, Midlothian. Mr. Scott was chairman and governing director of MacTaggart, Scott & Co., Ltd., Loanhead. He obtained his early engineering training with Lees Anderson, of Anderson, Napier Bros., Ltd., Glasgow, and Brown Bros. & Co., Ltd., Edinburgh.

Mr. J. Oliver.—The death is announced of Mr. John Oliver, Larbert, Stirlingshire, who retired last May after fifty-five years' service, with Carron Company. He was well known as the outdoor representative for Scotland, Northern Ireland, and the North of England of Carron Company's cooking and heating apparatus department. He was seventy-eight years of age.

Mr. Walter Emmett, an electrical engineer and former Mayor of Wakefield, has died at his home at Wakefield at the age of seventy-two. He had been a member of the City Council for twenty-seven years and when he was chairman of the Electricity Committee he took an active part in the reorganisation of the undertaking.

CORRESPONDENCE

Every letter must be accompanied by the writer's name and address preferably, but not necessarily, for publication. The Editors cannot accept responsibility for correspondents' opinions

Electricity Supply Statistics

THE British electricity supply industry is one of the best documented of the world's enterprises. Thanks to the admirable work of the Electricity Commissioners we have been kept informed, step by step, of every relevant fact in the growth and disposition of public electricity supply in this country. By means of the data thus collected and published, not only have the Commissioners themselves been able to make their long-scale plans, but each separate undertaking can measure itself by the yardstick of national statistics, whilst manufacturers and contractors have been able to compare and forecast the reactions upon their several businesses. Whilst the vociferous nationalists of other lands have been boasting of their five-year plans, the British supply industry has been quietly making *and fulfilling* its own appropriate plan for public electricity throughout Great Britain.

But the essence of planning is data, and the fountain head of data in the present case is the Commissioners' Annual Return of Engineering and Financial Statistics. Judge of one's dismay, therefore, to learn that they have decided to defer for the time being the publication of any further statistics. As it is now nearly a year since the last Return was issued all the material for the new volume must already be available, and no considerations of economy even of the shortest-sighted variety can justify such a decision. No doubt the phrase " in the national interest " can be used to bludgeon any action whatsoever, but there are few things less in the nation's interest than to interrupt the sequence of these most valuable records.

Even if it were judged imprudent to publish the figures for the separate undertakings, such an objection could not possibly apply to the publication of the summary tables that form the first part of the Return. If it is not entirely too late, may I appeal through your columns to those responsible for at any rate a partial reversal of this decision. Will not the Commissioners continue to put us all in their debt by publishing at least the core of their usual Return? D. J. BOLTON.

London, W.1, *March 2nd.*

Future of the Electric

If " Battery Maker " will bring along a German " electric " (carrying a British battery) that will run as far at the same speed under the same conditions as a British electric, I will give him £10. I am ready to agree that German batteries, as your contributor avers, are not quite so good as British, type for type, but I am sick of hearing battery people blame the electric vehicle makers for the so-called slow progress of the movement.

Surely the battery firms are more than pleased with the result of the last seven years' advance, due solely to the introduction of low-rate charging, the system an electric vehicle manufacturer absolutely had to force upon them, and which has given them sales of nearly 6,000 batteries since. As Mr. Wilson says—and as everyone knows—battery design has been stagnant for 20 years, but I see no reason why battery *price* should be the same as it was 20 years ago, whilst the price of electric vehicles, chargers and electricity has been reduced to one-third.

How do battery makers account for this state of affairs in Great Britain? Had battery prices kept pace 100,000 electric vehicles would be in use here. It is no good saying that price remains the same because batteries are improved and therefore last longer. I get to-day's life out of batteries made 18 years ago, when using to-day's charging system. On efficiency and weight, the British electric of to-day, even though the crudity of batteries requires it to be able throughout its life to carry an *extra* load equal to its payload is no heavier (less fuel) than its petrol prototype; but it is four times as efficient and very appreciably lighter and more efficient than German electrics.

The fuel and tank of a petrol vehicle weigh approximately 3 ounces per horse-power-hour, and the vehicle is about 20 per cent. efficient. The battery your correspondents would advocate for an electric vehicle weighs 1,300 ounces per horse-power hour, and the vehicle is over 80 per cent. efficient. If electric vehicle manufacturers could get the whole of the missing 20 per cent. (a ridiculous proposition, akin to hunting for perpetual motion) what use would it be compared with the tremendous leeway battery makers have to make up reducing weight and price.

The simple fact is that battery makers, apart from one new firm, have sat by and watched electric vehicle manufacturers do *all* the useful work. In spite of all, however, so long as speed suitable to round work is used, and distance does not exceed 50 miles per day, the British electric can cart around the British battery and still carry its payload more cheaply than any other type of vehicle. H. N. OUTRAM,

Ormskirk, *March 4th.* (*Victor Electrics, Ltd.*).

Electrical Thawing

The letter in your issue of February 2nd from Mr. C. W. Salt, city electrical engineer of Carlisle, was most interesting, and on the strength of it I immediately set to work on a ½-in. lead water service which had been frozen for a month.

The maximum current obtainable was 100 A, but I thought that if 150 A would thaw a pipe in from 5 to 7 minutes, 100 A should do it in about 20 minutes. But after an hour there was no appreciable temperature rise. I then made a few calculations, from which it appeared that over 90 A is required for half an hour to raise 100 lb. of lead (the approximate weight of the service) through 5 deg. F., disregarding all heat losses.

If radiation, and the heat required to turn ice at some unknown temperature to water at 32 deg. F. are taken into account, it would seem that a current far in excess of 150 A would be required to thaw the pipe in 5 minutes.

Birmingham, *February 27th.* J. E. GILBERT, A.M.I.E.E.

War Damage Insurance

Mr. Woodhouse's ventilation of proposals to spread the cost of insurance against war damage to electricity supply undertakings (ELECTRICAL REVIEW, February 16th) is timely.

I fear, however, that there may be a reluctance to come into a scheme on the part of undertakings whose owners consider their property safe for geographical reasons. This reluctance would persist until a " safe " power station was hit or until statutory powers were taken to spread the burden over the whole industry. The latter action is overdue.

No valid arguments can be advanced against the principle of a levy to meet war damage to be made after damage has been done—unless the principles adopted for change of frequency, and financing the Commission, are all wrong. The Conjoint Conference of Public Utility Authorities could agree and request the Government to give statutory force to its agreement. As a matter of interest, the following is an extract from a letter by me to official quarters dated September 25th, 1939 :—

> " I was wondering, therefore, whether you have already considered, or whether you would consider, the practical proposition for a war damage insurance for supply authorities on the basis of a levy on all undertakers similar to the levy for the standardisation of frequency and the national pool of reserve equipment."

A promise was given that the proposal would receive consideration. It may well be, therefore, that the wheels are already in motion. D. BELLAMY.

Hull, *February 27th.*

The Wider Outlook

I was interested in the letter from Mr. D. Maclaren Cathcart which appeared under the above heading in your issue of February 23rd. The narrow specialisation of most engineers tends to leave them with an intellectual outlook which is very lop-sided. The interests included under the general term " culture " are often merely regarded as non-essentials which are likely to have a disturbing effect on production. Progress, for the engineer, is usually regarded as an approach towards a higher mechanistic efficiency rather than towards the development of a higher type of individual.

A realisation of the dangers associated with this intellectual parochialism has produced two developments which might be of interest to your correspondent; one is the formation by a group of engineers in London and Manchester of a club, called the Nasmyth Club, for carrying out researches in the art of living; the other is the organisation of the social activities of a community of some 250 people, which was evacuated from London into the country and which has now some twenty-four activities in full swing, including amateur theatricals, choral society, French, German and Russian classes, horticultural society, lectures, and so on.

(*Concluded at foot of next page.*)

IN THE COURTS

By Our Special Reporter

Tubular Lamp Patent Action

IN the Chancery Division on March 1st Mr. Justice Bennett had before him an action brought by Mr. Hermann Meyer, London, N.W., and Ismay Boro Tube Light, Ltd., Dagenham, against Evenlite Tube Lamp Developments, Ltd., London, E., and J. Lyons & Co., Ltd., West Kensington, for an injunction to restrain the defendants from infringing the plaintiffs' letters patent No. 409953 and the usual ancillary relief in a patent action.

The plaintiff Mr. Meyer is the owner of the letters patent in question and granted for "an improvement in or relating to electric incandescent lamps of tubular form" and the second plaintiffs are the exclusive licensees under the letters patent. The plaintiffs in particular complained of (1) the sale and supply by the defendants, the Evenlite Co., to Messrs. Dunsbier & Rogers, Marchmont Street, London, W.C., in June, 1937, of six "Evenlite" tubular lamps, and (2) the manufacture shortly prior to June, 1937, by those defendants of the aforesaid lamps at their factory.

Further, the plaintiffs complained that prior to the issue of the writ and subsequent to the acceptance of the complete specification of their letters patent the defendants, J. Lyons & Co., had infringed the letters patent by the use of incandescent lamps of tubular form manufactured in accordance with the invention described in the complete specification.

By their defence the defendants counterclaimed for revocation of the plaintiffs' letters patent upon the grounds that the invention was not novel by reason of prior publication, prior user, the prior general common knowledge; by the manufacture and sale by Violite, Ltd., at their premises in Great Windmill Street, W., from June to September, 1932, of lamps under the reference type of "Barlux"; and by the public manufacture and sale by Maple & Co. at their premises in Tottenham Court Road from September to December, 1932, of lamps under the reference type of "Barlux."

Further, defendants said that the lamps referred to had been offered for sale and sold to the public in the ordinary course of business prior to the date of the application for plaintiffs' letters patent.

Defendants further said that the alleged invention was not a matter of new manufacture and the subject of letters patent and grant of privileges within Section 6 of the Statute of Monopolies; that it involved no inventive step and was not useful. Defendants also pleaded that the plaintiffs' complete specification did not sufficiently and clearly ascertain the scope of the monopoly claimed.

On Monday last Mr. Hermann Meyer, the plaintiff and owner of the patent, gave evidence in great detail explanatory of the differences and the advantages his lamp had in efficiency over the "Barlux" lamp.

An Tuesday Mr. Meyer continued his evidence at the conclusion of which Mr. Lloyd Jacobs, before calling evidence and in opening the case for the defendants, dealt with the question of the validity of the plaintiffs' specification and of the validity of the patent. Mr. Jacobs dealt at length with the question and with the provisions of Section 25 of the Patent Act with a view to showing that the patentee had not the right to the monopoly he claimed to have.

The case was still proceeding as we went to press.

Electric Sign Dispute

On March 1st in the Chancery Division Mr. Justice Farwell had before him an action brought by Berkeley & Young, Ltd., Birmingham, and A. M. Goodman, Ltd., London, W.C., against Stillwell Darby & Co., London, W.C., and Mr. Joseph Konig, London, W.C., for an injunction restraining the defendants, their servants and agents from threatening any person with an action for infringement of patent or for proceeding in respect of certain advertising signs manufactured, sold and used or dealt with by the plaintiffs. Plaintiffs also sought a declaration that the threats were unjustifiable and they also asked for an inquiry as to damages. The plaintiffs are manufacturers of electric signs which they market through Messrs. Goodman.

Defendants pleaded that the signs in question were a copy of their "Vibralux" sign for which they held the patent. They denied that they had threatened persons with actions for infringement and in the alternative they said that if the threats were made they were justifiable. The letters patent which the defendants claimed had been infringed was No. 435911 granted to Mr. Joseph Konig for improvements in or relating to apparatus for producing vibrations in electric light signs. Defendants also set up a counterclaim that their patent was valid and that plaintiffs had infringed it and they also sought an injunction to restrain the plaintiffs from infringing their patent and claimed damages.

Plaintiffs, in reply, sought a revocation of the defendants' patent on the usual grounds of want of novelty and prior publication.

In giving judgment on March 5th his Lordship said the action started as one against threats but it developed into a full dress patent action. There were three questions with which he would have to deal, viz. (1) the question of threats, (2) the question of infringement, and (3) the question of the validity of the patent. With regard to threats he came to the conclusion that the two letters written by the defendants constituted a threat which resulted in damage to the plaintiffs. There would be an inquiry as to the amount of damages the plaintiffs were entitled to.

He was satisfied that there had been no copying of the defendant's designs by the plaintiffs. It was untrue that the defendant company held all the British patents. They belonged to the second defendant and as to the question of infringement of Konig's patent he held that the make-up of plaintiff sign was quite distinct from Konig's patent and there had been no infringement by the plaintiffs. On the question of the validity, Konig's patent was invalid by want of novelty.

The plaintiffs succeeded and were entitled to an injunction and an inquiry as to damages and the costs of the action. He dismissed the defendants' counterclaim. Plaintiffs succeeded on the issue of validity.

Winding-up Petition Postponed

In the Companies' Court on March 4th Mr. Justice Crossman had before him a petition for the winding-up of the Asbestos, Molybdenum and Tungsten Co., Ltd., on the petition of Lionel Crystoline Asbestos Co., Ltd., and Austmac Investments, Ltd., who are shareholders in the respondent company.

Mr. T. D. D. Divine, for the petitioners, said that negotiations for a settlement had been proceeding, but rather slowly, and he was instructed now that it was unlikely that they would come to fruition. He understood that the respondent company had put in more evidence and that its Counsel was going to ask for an adjournment of the hearing of the petition.

Mr. D. L. Oliver, for the respondent company, said that if the negotiations for a settlement broke down he would ask for a day to be fixed for the hearing of the petition which was a very heavy one. He asked for an adjournment for one week and this was agreed to.

Correspondence (*Concluded from page 279*)

If your correspondent is interested in these subjects, I shall be pleased to tell him more. A. R. COOPER.

Cheam, *February 29th.*

"Protagonists"

The slipshod use of this word is destroying its meaning which we cannot afford to do without. Many people believe that it is the opposite to "antagonist" and that it has the same meaning as "advocate." Thus in the ELECTRICAL REVIEW of February 23rd (page 220) Mr. A. M. Taylor writes, ". . . intended to put the protagonists of AC transmission on their mettle."

The word "protagonist" means in the first place the actor who played the chief part in a Greek drama and hence a leader in any enterprise. It is used in this sense in the same number of the REVIEW, in the article on Crompton which reads "the two protagonists often discussed their early warfare." The word "advocate" is adequate where its meaning is intended and one can express one's meaning by writing "advocates of AC transmission," so why not do it and preserve two words in the language with clear meanings instead of having one with two hazy menings VERB. SAP.

February 4th.

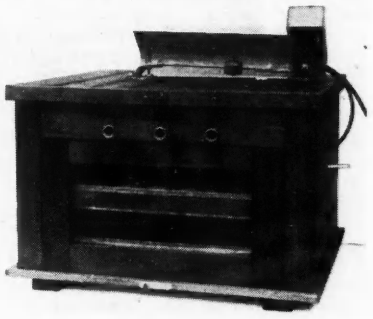
[Mr. E. G. Spicer (Northmet Company) asks us to state that he is not the "E.G.S." whose letter on behalf of the Executive Committee, Northmet Branch, N.U.D.A.W., appeared in our issue of Feb. 16th.—EDS., ELEC. REV.]

NEW ELECTRICAL PRODUCTS

A Review of Equipment Recently Marketed

Combined Incubator and Brooder

AN automatically controlled incubator that can be quickly converted into a brooder is being introduced by CURFEW APPLIANCES, Ottershaw, Surrey. It is constructed of timber, heat-insulated at top and sides and lined with galvanised metal. Permanent vents at the top are supplemented by adjustable vents for regulating humidity during incubation. The square galvanised hatching tray can be replaced in a different position every time that the eggs are turned.



"Curfew" combined incubator and brooder used as an incubator

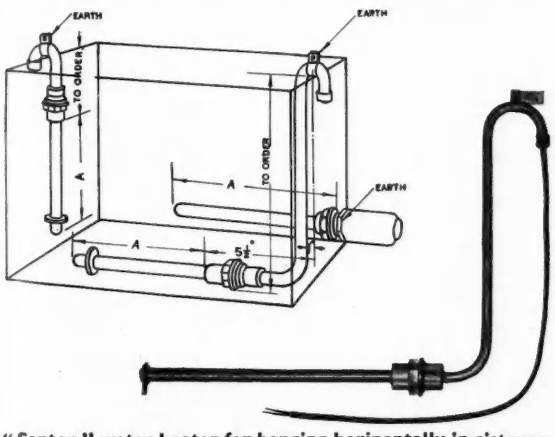
Incoming air passes through a damp canvas supported in the water tray. The curtain for the brood chamber, which is attached to a wooden panel taking the place of the glass door used for incubation, is double with staggered slits in order to prevent draughts.

Even heating is provided by a grid of elements run at black heat which extend over the top of the chamber and are protected by a wire guard. A mercury trip thermostat operated by a capsule and rod is claimed to keep the temperature steady to within ¼ deg. F. A thermometer graduated from 60 to 100 deg. F. is inserted through upper holes in the side for incubation and lower holes for brooding.

The appliance is made in 60-egg and 100-egg sizes, loaded respectively at ¾ and 1 kW. It is designed for AC operation at 200 to 250 V, while for DC mains a solenoid switch is fitted in conjunction with the mercury-trip control.

Avoiding Freezing Up

The damage to domestic water systems during the recent severely cold weather has made many householders resolve to avoid similar troubles in future. To assist them, SANTON, LTD., Somerton Works, Newport, Mon., has brought out a simple form of water heater which entails no installation costs, but only requires plugging in to ensure that the system is proof against freezing.



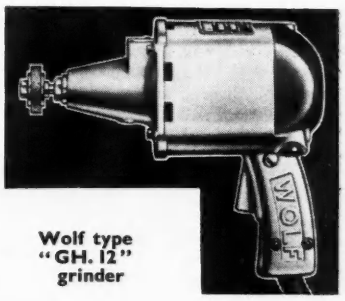
"Santon" water heater for hanging horizontally in cisterns, and the method of using the different types of heaters

One model simply hangs vertically or horizontally from the side of the cistern and can be switched on or off as need arises. Another pattern for permanent fixing to the cistern horizontally is provided with a small flange necessary to complete the fitting after piercing a hole in the vessel to receive it. In both patterns the heater is loaded at 250 W for an 8-in. length and 400 W for a 12-in. length.

In addition to the purpose mentioned the heaters are also extremely useful for slightly warming drinking water for animals, poultry, &c., and for many other uses. Other models are available for car radiator or sump heating.

High-speed Portable Grinder

The new type "GH 12" 1¼-in. high-speed, ball-bearing, portable, electric grinder made by S. WOLF & CO., LTD., Pioneer Works, Hanger Lane, Ealing, W.5, is suitable for grinding and polishing dies, moulds, patterns, &c., and also for general light grinding. It will be found particularly useful in tool rooms, drop forges, pattern shops and foundries. A universal motor running at 17,000 RPM is incorporated with a direct drive to the spindle.

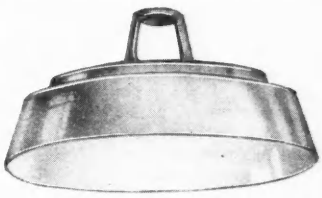


Wolf type "GH. 12" grinder

The motor frame is made of an aluminium alloy of high tensile strength, the balanced armature being carried on adjustable ball bearings. A double-pole, double-break trigger switch is fitted in a dust and moisture proof bakelite housing, non-hygroscopic insulation being provided throughout. The grinder measures 6⅞ in. long, 6¾ in. high and 2⅝ in. wide, and has a net weight of 3¾ lb.

New "Coolicon" Shade

A new "deep" design of "Coolicon" shade introduced by the BENJAMIN ELECTRIC CO., LTD., Brantwood Works, Tariff Road, Tottenham, is now available from the GENERAL ELECTRIC CO., LTD., Magnet House, Kingsway, London, W.C.2, and others.



"Deep" model "Coolicon" shade

It is of white opal glass, and is so shaped that it not only gives maximum lighting results, but lends itself to better packing and so reduces the possibilities of breakage. It is made in two sizes, 9 in. and 11 in., the canopy in each case having a 1¾-in. diameter hole for use with a standard lampholder.

Battery Valves

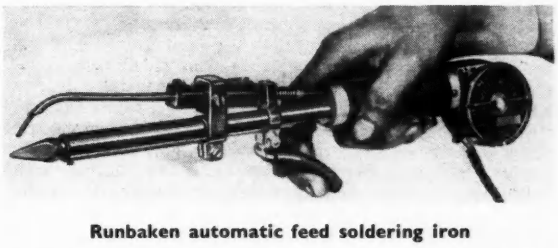
MARCONIPHONE, LTD., Hayes, Middlesex, announces a new range of valves for "all dry" battery operation having 1.4-V, 0.05-A filament and octal bases, and designed for use with 90 V maximum HT. A new output tetrode, the "KT 35," is available for AC/DC receivers.

Air-raid Shelter Signs

Air-raid shelter signs of both horizontal and vertical types, single or double sided, are now being made by LINOLITE, LTD., 100, Victoria Street, London, S.W.1. In each case a single 15-W lamp is used, the correct illumination being obtained by special baffles round the lamp and by mirrors on the inside ends of the sign.

Self-feeding Soldering Iron

A soldering iron with an automatic feed is the latest development of RUNBAKEN ELECTRICAL PRODUCTS, 13-15, Liverpool Road, Deansgate, Manchester. Not only does this device save solder, but it also enables the operator to have one of his hands free. Work is thereby improved and accelerated. The iron is light in weight, though its robust construction enables it to withstand hard work and last indefinitely. It is accurately made and well finished, all parts being interchangeable. The iron is supplied with six spools of cord solder.



Runbaken automatic feed soldering iron

NEW BOOKS

Electrical Machines. Industrial Studies. Fundamentals of Radio.

Introduction to Electrical Machines. By A. W. HIRST, M.Sc. (Eng.), M.I.E.E. Pp. 122; illus. Blackie & Son, Ltd., 50, Old Bailey, London, E.C.4. Price 5s.

This is the first of a series of books which is being published with a view to enabling the student to cover in easy stages the many subjects which are grouped under the heading of electrical engineering. The general standard is that of the engineering degree although the publishers express the hope that the books will meet the needs of the practising engineer as well as those of the technical college student. It is recognised, however, that there are certain fundamental principles which may be said to form the foundation of almost every branch of the science of electrical engineering, and in order to avoid repetition, these are treated in the volume under review, the author of which is also the general editor of the series.

With this end in view, the first chapter deals with electromagnetism and electro-magnetic induction, while the second covers the magnetic circuit and the usual calculations which are met with in determining the various particulars of this circuit. These two chapters constitute a very concise survey of the subjects named and should be found useful for reference in studying the subsequent volumes of the series. Thence the author discusses the general problems of the elementary forms of electrical machines, both generators and motors, the materials used in their construction and the various losses to which they are liable, while in the final chapter the important subject of wave form is dealt with and the mathematical theorems underlying the usual methods of harmonic analysis are discussed. Numerical exercises, some of them taken from university examination papers, are included wherever possible, the answers being given at the end of the book.

Having mastered this volume the student should be in a good position to commence the study of the induction motor which forms the subject of the second volume of the series. It is in this way that the publishers are fulfilling their design of covering the subject of electrical engineering in stages, while at the low price at which the books are sold, the student—even if he has only limited means at his disposal—will be able to purchase them at appropriate intervals.—A. R.

Electrical Technology. By H. Cotton. Fourth edition. Pp. 541; figs. 935. Sir Isaac Pitman & Sons, Ltd., Parker St., Kingsway, London, W.C.2. Price 12s. 6d.

This is the fourth edition of a work which was thoroughly recommended as a students' textbook in the review of the previous edition that appeared in our columns two years ago. The chief modification from the third edition is that in the section on AC working the theory of polyphase circuits follows immediately after the single-phase circuit, with a view to treating alternators and synchronous motors as polyphase machines instead of single-phase only. An addition is the inclusion of the fundamental principles of operation of the polyphase as distinct from the single-phase commutator motor. The chapter on illumination has been enlarged by a short description of the discharge lamp and transferred to the end of the book.—C. O. B.

Static and Dynamic Electricity. By WILLIAM R. SMYTHE. Pp. 537; illus. McGraw Hill Publishing Co., Ltd., Aldwych House, London, W.C.2. Price 40s.

This book is a work of excellent quality and it is evident that in attaining this high standard the author has drawn upon a wide experience in the art of instruction, while presenting his subject matter in that straightforward manner characteristic of the best American scientific literature. The first portion of the book considers the fundamental concepts of electrostatics, and deals with condenser, dielectric and potential problems. This is followed by general theorems and by a comprehensive discussion of two-dimensional and three-dimensional potential distributions. Then come electric currents, electromagnetic effects, transient phenomena, eddy currents and magnetism, and two chapters dealing with electromagnetic waves and the influence of relativity on the theory of motion of a charged particle. The final chapter is devoted to an exceedingly clear survey of the modern theory of the static electrical properties of matter.

The treatment is essentially mathematical and for a full appreciation of the value of the book a sound grounding in mathematics is required, as also is a thorough familiarity with the rudiments of electricity and magnetism. The choice of the electrical units employed is carefully indicated throughout the text. The author's primary intention appears to be to give the student an insight into the use of mathematics in attacking the various problems, the result itself and the phenomena associated with it being rather the secondary consideration. At the same time, however, although many of the more familiar applications of electricity are deliberately omitted from the text, the author does not eschew the practical viewpoint, and gives numerous examples of the application of theory to practice.

The book is extremely well documented, and each chapter concludes with a wide range of problems, the majority of which will certainly exercise the ability of the average reader. The appendix comprises an excellent summary of the systems of electrical units, a most valuable adjunct both for instruction and in reference. While the book is unlikely to attract the more practical man, or the reader who prefers to limit his use of mathematics merely to the statement and proof of formulæ, it will be a very valuable and helpful addition to the equipment of the advanced student of electrical engineering or physics, and to the research worker in these fields.—P. M. H.

Operation Analysis. By H. B. MAYNARD and G. J. STEGEMERTEN. Pp. 298; figs. 107. McGraw Hill Publishing Co., Ltd. Price 18s.

A great deal of thought has been put into the correct working conditions of the operators, which tends to improve output, both in quantity and quality. The basic principles of "Operation Analysis" which have been evolved by the authors can be transferred not only from industry to industry, but from office to office, with a considerable increase in efficiency where applied correctly.

The first sections deal mainly with a survey of recent economic and industrial developments, with interesting references to the economic strata of society, and is characterised by candid and constructive criticism of some recent methods of fixing piecework rates by rule of thumb methods. Modern conditions demand that scientific methods must be cultivated if the duties of those engaged in setting of times and prices on any operations in the industrial world are to be carried out efficiently. The book fills a big gap in the literature available on this interesting subject.—H. J. T.

Modern Radio Communication. By J. H. REYNER. Vol. 1. Seventh edition. Pp. 334; figs. 156. Sir Isaac Pitman & Sons, Ltd. Price 5s.

This well-known textbook, which was first published sixteen years ago, has been brought up to date in this seventh edition. The sixth edition appeared three years ago and, as the book deals essentially with fundamentals, the amendments and additions required have not been extensive.

This volume is intended to provide a groundwork in the theory of radio communication, and it does it very well. The text forms a good sketch of the whole subject. It is clear and accurate, so far as it goes, but necessarily very concise due to the extent of ground covered. Only an elementary knowledge of mathematics and electricity is assumed. Examples are given at the ends of chapters, with answers at the end of the book. The text covers the scope of the preliminary and intermediate grades of the City and Guilds examinations, and the questions set in the 1934 and 1937 examinations are reproduced. The new edition will be welcomed by students as an up-to-date summary of the fundamentals of radio communication.—C. J. C.

Shorter Notices

"AC Motors and Control Gear." By C. H. Claude Cooke. Pp. 88; figs. 20. Crosby Lockwood & Son, Ltd., Stationers' Hall Court, London, E.C.4. Price 3s. 6d.

"Symmetrical Component Analysis of Unsymmetrical Polyphase Systems." By R. Neumann. (Pp. 219; figs. 84.) Price 21s.

"The Superheterodyne Receiver." By Alfred T Witts. (Pp. 189; figs. 114.) Sir Isaac Pitman & Sons, Ltd. Price 3s. 6d.

"Short-wave Radio." By J. H. Reyner. (Pp. 176; figs. 93.) Sir Isaac Pitman & Sons, Ltd. Price 8s. 6d.

"Engineering Reorganisation." By James J. Gillespie. (Pp. 268; figs. 70.) Sir Isaac Pitman & Sons, Ltd. Price 12s. 6d.

"Records and Research in Engineering and Industrial Science." By J. E. Holmstrom. (Pp. 302.) Chapman & Hall, Ltd., 11, Henrietta Street, London, W.C.2. Price 15s.

COMMERCIAL and INDUSTRIAL NEWS

Electric Vehicle Manufacture. The New Fluorescent Lamp. Scottish Electricians' Wages. The Morecambe Appointment. Training Engineers.

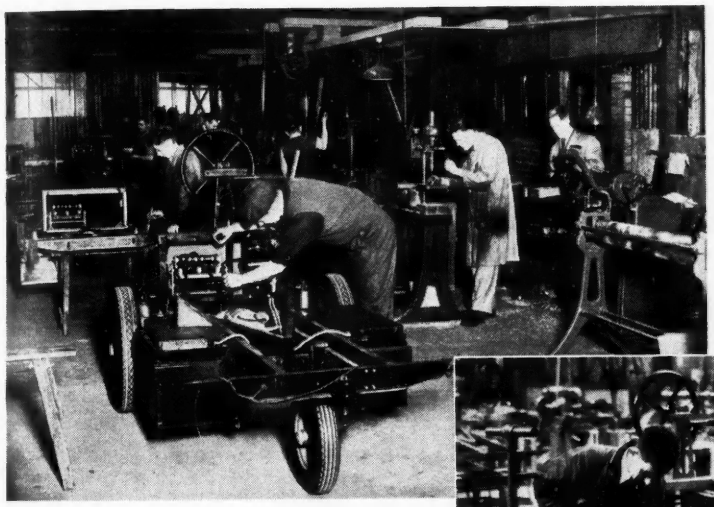
Anglo-French Trade Talks

ECONOMIC questions of concern to both countries have been raised at the Anglo-French industrial talks which, sponsored by the F.B.I. with the approval of the British and French Governments, have been held in London this week. Lord Dudley Gordon, President-elect of the F.B.I., led the British spokesmen, and the visiting delegates represent a wide and powerful group of French industries. The discussions dealt with methods by which the industries of the two countries can remove such difficulties as stand in the way of full co-operation in the war effort. Views were also exchanged on the best means by which, after the war, the industries of Britain and France can contribute to an orderly transition to conditions of peace and to the making of a more sound and stable economic system.

The French delegates included Monsieur Detoeuf, president of Le Syndicat Général de la Construction Electrique, and members of the British delegation included Sir William Larke, Director of the British Iron & Steel Federation, Mr. A. C. Macdiarmid, chairman and managing director of Stewarts & Lloyds, Ltd., and Messrs. G. Locock (Director) and C. F. I. Ramsden (Foreign Director) of the F.B.I.

Making Electric Vehicles

The rationing of petrol and its rising cost are likely to create a considerable increase in the demand for electric vehicles for delivery and other short-distance work. Manufacturers are therefore making plans to meet these requirements and are accelerating their output. A near approach to mass production has now been made possible at the works of Murphy Cars and Trucks, Ltd., Cordwallis Road, Maidenhead, by an almost complete reorganisation and rearrangement of the factory.



A portion of the new production line at the Murphy Cars and Trucks electric vehicle factory and (right) connecting up the cells of a battery

Till recently a store room, a 2,000 sq. ft. section has now been laid out solely for the production of bodies, this leaving another 6,000 sq. ft. for making the other components and for assembly. An output of seven vehicles a week, instead of two previously, is aimed at, and Mr. B. G. Suthers, the managing director, told us when we visited the works a few days ago that it was proposed to plan production in batches of twenty-five vehicles. Thus twenty-five chassis, back and front axles, sub-assembly frames, bodies, &c. (as well as the same number of motors, controllers, switches and other electrical equipment which are made at the works of the associated company, Nelco, Ltd., at Shalford, Guildford) will be made and then assembled on a new assembly line extending almost the whole length of the factory.

These batches of twenty-five vehicles will all be of the company's popular 10 cwt. three-wheel type and in addition it is proposed to turn out ten of the larger 15 cwt. four-wheel models at the rate of two per week. With the new facilities available, further improvements in design are being incorporated which are likely to add still further to their attractiveness and render them yet more foolproof. Fabricated construction is now employed throughout and the company has just acquired a large site close to the existing factory in readiness for future expansion.

Easter Holidays

Owing to the Easter Holidays, classified advertisements for our issue of March 22nd should reach our Advertisement Department by 5.30 p.m. on Monday, March 18th.

The Export Council

A White Paper was published this week setting out the aims and methods of the Export Council recently set up under the chairmanship of the President of the Board of Trade (Sir Andrew Duncan). It is considered vital that individual industries should have their own export committee or group to work in co-operation with the Council. Support from the Government to a degree never contemplated in peace time is envisaged and reference is made to the inevitability that there must be some diversion of effort from the home market. Machinery will be set up to deal with the allocation of raw materials for export orders. Discussions have already commenced between the Council and a large number of industries.

A New Fluorescent Lamp

In our last issue we gave some particulars of a new 5-ft. tubular fluorescent discharge lamp which we had received from the British Thomson-Houston Co., Ltd., and the General Electric Co., Ltd. We have now received further particulars from the Electric Lamp Manufacturers' Association. The lamp, which is for operation on 200/250 V AC 50-cycle supply mains, has an initial efficiency of 35 lumens per watt, or about 32 lumens if choke losses are taken into account. The initial output of the lamp is 2,800 lumens, comparing well with the 2,900 lumens of a 200-W gas-filled lamp or the 2,680 lumens of two 100-W lamps. The life of the new lamp is 2,000 hours. The total amount of heat generated by the lamp is about one-third of that generated by gas-filled lamps of the same light output, and a lower percentage of the total is emitted in the form of radiated heat. When lighted, the lamp is cool enough to handle with no discomfort. The control gear necessary for this lamp is identical with that for the 80-watt mercury lamp (type MB/V), and is interchangeable with it, but an additional condenser and thermal switch are required. In addition to the B.T.H. Co. and the G.E.C., the following members of E.L.M.A. have informed us that they are making the new lamp:—The Edison Swan Electric Co., Ltd.; Philips Lamps, Ltd., Siemens Electric Lamps & Supplies, Ltd.; Crompton Parkinson, Ltd.; and the Metropolitan-Vickers Electrical Co., Ltd.

The Edison Swan Electric Co., Ltd., has sent us a pamphlet (No. L1216) containing a description of the "Royal Ediswan" 80-W fluorescent discharge tube and equipment.

Crompton Parkinson, Ltd., state that there appear to be three main types of interest in the "Crompta" fluorescent tube. There are shopkeepers who wish to display to best advantage coloured goods used mainly in daylight, while there are manufacturers who are not interested so much in the perfect colour rendering alone as this taken in combination with the absence of shadows. There are also manufacturers to whom colour selection and colour matching in process work is a vital part of their production cycle.

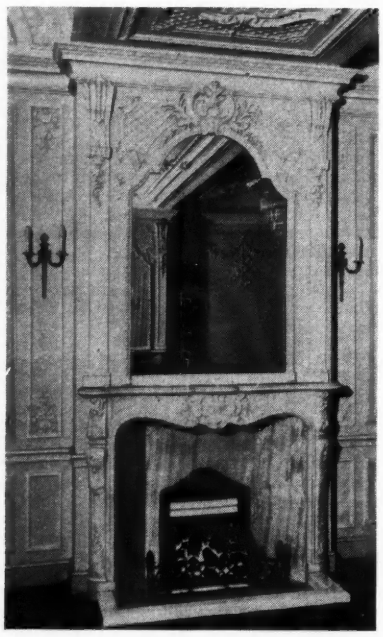
Scottish Electricians' Wages

A special war bonus for journeymen electricians in Scotland became operative on March 1st. An agreement reached between the Electrical Contractors' Association of Scotland and the Electrical Trades Union grants the bonus based upon cost of living figures issued by the Board of Trade. The bonus is given over and above the standard rate of 1s. 7d. per hour, which remains unchanged. The following are the points of the agreement:—The bonus is to be paid at an hourly rate

of ¼d. per hour for every three points rise in the cost of living index figure above the peace time level of 155 points, and a corresponding decrease for every three points fall. The bonus is to be paid on the actual number of hours worked including overtime at overtime rates and will be payable on and from March 1st. The total bonus at that date is agreed at 1¾d. per hour on the basis of 22 points rise above the datum figure and is to be stabilised at that figure for three months. The bonus will be adjusted at three-monthly periods and the agreement remains in force until December 31st next.

Electric Heating in a Theatre

The interior of the Haymarket Theatre, London, has recently been remodelled and much has been done to add to the comfort of its patrons. An interesting example is the new lounge bar with its French period decoration. This lounge has a large open fireplace, but the heating is by an electric fire, and in order that this modern form of heating shall harmonise with its surroundings a 3-kW "Louis Rayberry" fire with dogs, made by Berry's Electric, Ltd., has been installed with pleasing effect.



A "Louis Rayberry" fire in the lounge bar of the Haymarket Theatre

North-East Coast Equipment Pool

At a meeting of the Tees-side Chamber of Commerce at Middlesbrough last week the chairman (Captain A. Hayton Ewap) reported that he would call a meeting as soon as possible of the sub-committee to deal with the scheme for pooling electrical spares. He added that the North-Eastern Electric Supply Co., Ltd., was co-operating in the plan and replies had been received from other local concerns. He referred to the vital necessity of maintaining electricity supply for local industries.

E.I.B.A. (Manchester Branch)

How to stimulate interest in the work of the Electrical Industries Benevolent Association was discussed at an informal luncheon-meeting held at the Midland Hotel, Manchester, on March 4th. Mr. J. H. Farthing (director G.E.C.), who presided, confessed to being extremely disappointed by the cold attitude to the E.I.B.A. by people in the electrical industry.

Ald. G. H. White (Lord Mayor of Manchester), who also has interests in the electrical industry, said he held the opinion that the various electrical trade organisations in the Manchester district were not pulling their weight. Manchester, which was the natural centre for a population of about 3,000,000, was the first city to come along with a definite contribution. Although there were difficulties in the way of a City Council voting a definite and continuing annual subscription, there was no reason why it should not vote a lump sum, say £250, which would be more than the equivalent of £50 per annum for five years.

Mr. H. Senior Fothergill (secretary of the E.I.B.A.) explained how adversely the funds of the Association had been affected by the war, specially through the cancellation of social functions. On the other hand, demands on the E.I.B.A. had advanced from £8,000 to £9,000 per annum.

Mr. J. W. Garsden (Edison Swan Electric Co., Ltd.), thought that good support would be forthcoming if meetings and functions were held in the various Lancashire towns, in Blackburn for instance. Another proposition was that there should be regular weekly staff collections. If only one penny per person per week were subscribed the annual total would be substantial.

Mr. L. E. Wilson (secretary, E.I.B.A., Manchester), explained the work he had been doing in getting branches of the E.C.A. interested in the benevolent fund.

Iron and Steel Scrap Prices

The Iron and Steel (No. 7) (Scrap) Order, 1940, which came into effect on March 5th and supersedes the Control of Iron and Steel (No. 5) (Scrap) Order, 1939, fixes new prices for iron and steel scrap. The effect of the new Order is to increase the main range of maximum prices of iron and steel scrap by 5s. to 10s. a ton, and adjustments to meet changing conditions have led to larger increases in a few cases. Certain additions have also been made to the specification of the material concerned by the maximum price provisions.

British Plant for Turkey

The Istanbul correspondent of the *Times* reports that the Eti Bank has signed a contract with the Metropolitan-Vickers Company, and associated concerns for the erection of a power station at Chatalazi, on the Black Sea coast, near Zonguldak, to provide power for the Zonguldak coalfields and later the modern port which is to be constructed at Zonguldak. The value of the contract is £1,500,000 and payment will be made from the credits granted to Turkey by Great Britain.

Women in Engineering

The important part which women would be expected to play in engineering during the war was outlined by Mr. Ernest Brown, Minister of Labour and National Service, at a luncheon held at the Park Lane Hotel, London, on Monday, to celebrate the 21st birthday of the Women's Engineering Society. He said that practical use must be made of the abilities of women. That the entry of women into industry was fully justified was evidenced by the continued increase in the employment of women since the last war, and the matter-of-fact acceptance in the present day of the assumption that the immense expansion in industry necessitated by the requirements of war would be assisted by the recruitment of still further numbers of women.

A message from the Queen read by Miss Caroline Haslett, the president, who took the chair, pointed out that the enlarged opportunities for women in engineering, fostered by the watchful care of the Society, were of especial value to-day, when the engineering skill of women might prove of great service to the country. The Queen was glad to learn that special classes had been organised to fit candidates for this new service for their country. Miss Haslett said that freedom meant a lot to women and hoped that they could play a much greater part in the war. She asked that people responsible should take advantage of women engineers' services at once so that their work could be fitted into the national scheme.

Other speakers were the Dowager Lady Swaythling, president of the Electrical Association for Women; Miss Pauline Gower, head of the Women's Section of the Air Transport Auxiliary; and Miss Monica Maurice, mine lighting engineer.

Cooking Demonstrations in Yorkshire

Special wartime economy cooking demonstrations are being given by Electricity House, Ltd., at its seventeen branch shops in Yorkshire. A standard advertisement has been prepared for the local Press with the theme of "Don't Ration Nourishment." Typical examples of talks given by the company's demonstrators are "Lunch without Coupons," "Cheerful Rationing," "A Wartime Dinner," "Catering for Evacuees," and "Sugarless Cookies." These demonstrations are proving very satisfactory and a real help to the company's customers. Some attractively coloured folders have also been issued by the company, setting out its hire-purchase terms for electric cookers, fires, radio, wash-boilers, washing machines and refrigerators.

Refrigerator Factory Extensions

Although the factory of Coldair, Ltd., at Wembley was erected only two years ago, steps have already been taken to increase the output. A part of the factory which hitherto has been used for storage of finished cabinets has, for instance, now been devoted to manufacturing processes, and it has also been necessary to convert the extensive showrooms for the same purpose. The sheet metal department and the test rooms have both been extended to twice their original size, provision thereby being made not only to increase output, but also to ensure that the various stages of manufacture shall still be properly checked.

The test section of the extended Coldair factory, where each refrigerator is left running for seven days under severe operating conditions

Aluminium Supplies

The Ministry of Supply has made arrangements with the British Aluminium Co. and the Aluminium Co. of Canada for

substantial increases in the output of aluminium in the United Kingdom and Canada. In Canada, for instance, the increase in output is sufficient to make the total capacity of that country alone almost equal to that of Germany. The two companies have, moreover, undertaken to co-operate with the Ministry of Supply in developing any further increases in capacity which may be required.

The Ministry have also purchased the entire output of the British Aluminium Co. for 1940 and of the Aluminium Co. of Canada for the remainder of 1940 and the whole of 1941, less only that required for consumption in Canada and for fulfilling certain pre-war commitments. Basic prices approximately equal to those current in the United Kingdom and Canada before the war have been agreed.

Good News for Amateur Photographers

Many amateur photographers have mistaken impressions of the severity of the restrictions placed on the use of their cameras. The *Amateur Photographer*, however, informs us, on the authority of the War Office, that cameras can be carried and used anywhere in this country excepting, of course, in definite prohibited places, mainly of military character, a list of which appeared in the issue of our contemporary for September 20th, 1939.

The Morecambe Appointment

Discussion on the appointment of an electrical engineer took place at last week's meeting of the Morecambe Town Council. Originally the Council decided to advertise the position at a salary of £575 per annum, rising to £800. Fifty-one applications were received, and these were narrowed down to five by the Electricity Committee. Then the Council, at a special meeting in committee, decided to readvertise the position at a salary of £700, rising to £800, with the age limit raised from 40 to 45. Councillor W. Gardner, chairman of the Electricity Committee, told the Council last week that of the five applicants selected from the 51, the one they considered qualified for the post agreed to accept it conditional upon his being paid £940 per annum, the salary fixed by his association for the position. The Council agreed to delete the minutes of the special meeting in committee, and revert to the original policy which fixed the lower salary.

New Company

In our last issue we recorded the registration of Modern Electric Power Products, Ltd. This company is a subsidiary of British Electric Meters, Ltd., and its address is Morden Road, Mitcham. The objects of the new company are to undertake the manufacture of power transformers, meters, lamps, &c. Messrs. N. B. Coop and T. C. Braddock (directors of British Electric Meters, Ltd.), are the subscribing directors of the new company. The majority of the shares are held by British Electric Meters, Ltd.

I.E.E. London Students

Despite wartime conditions the London Students' Section of the I.E.E. has managed to arrange a good programme for the second half of its session. The meetings have been well attended and the social functions have been as successful as in pre-war years. To-day (Friday) the Section is holding its Problems Night, when six problems of topical interest will be discussed. Mr. Johnstone Wright (President of the I.E.E.) will give an address on April 9th. The following extra visits have been arranged in addition to those included in the Section's programme: March 9th, 2.30 p.m., Strand Electric Co., Ltd.; March 18th, 2.30 p.m., W. Hill & Son, organ builders; April 13th, 10 a.m., Westminster Hospital, X-ray Department. The visits are open to students and graduates under twenty-eight.

Training of Engineers

A new edition of the brochure entitled "Engineering Training" has been issued by the British Thomson-Houston Co., Ltd., one of the pioneers in this country of planned courses for candidates of all types. In sixty-six pages, supplemented by fifty-five illustrations, guidance is given in the choice of a course suited to individual requirements.

In the selection of trainees, educational qualifications are regarded as the starting point only. Final acceptance is determined by personal interview, at which high value is placed on personality, character and promise of practical competence. Youths are received from all educational sources and are trained for various positions in the company's service and that of its customers, covering all grades from the technical engineer to the skilled craftsman.

The following courses are provided:—(a) Student, for university and college graduates; (b) engineering, for youths with London matriculation or its equivalent; (c) drawing office, for youths with school certificate; (d) trade, works office, or clerical, for boys with a good general education. It is emphasised that ability is encouraged in whatever sphere it reveals itself, and the status of boys of proved ability is raised annually by transfer to higher courses. The company has never accepted premiums, being of the opinion that a boy of ability should not be handicapped by such financial consideration.

The brochure sets out in detail the various stages of the courses, giving the periods of training and rates of pay, which, for indenture apprentices, are graded in accordance with starting age and training course. In addition to annual increments a service bonus is awarded for satisfactory progress and a supplementary bonus for success in the examinations of the local technical college.

Trade Announcements

Due to the expansion of its sales organisation in the Manchester area and in order to provide better service, the Brush Electrical Engineering Co., Ltd., has opened new offices at Daimler House, Wilmslow Road, Rusholme, Manchester, 14 (tel.: Rusholme 2295-7). The offices at Haworth Buildings, Cross Street, Manchester, have been vacated.

The London offices of the Jackson Electric Stove Co., Ltd., are now open from 9 a.m. to 5.30 p.m. from Monday to Friday, and from 9 a.m. to noon on Saturdays.

The E.A.W. in Wartime

The ninety branches of the Electrical Association for Women are more active than ever. In a "live" organisation of this kind, the demand for new ideas and suggestions is continuous, and to help to meet this need a special wartime edition of the booklet "Suggestions for E.A.W. Branch Programmes" has just been produced, containing new ideas for meetings and discussions, many topical titles for lectures and demonstrations, particulars of slides and films available, and suggestions of books useful for study circles and for reading aloud at work parties. Particulars of ways in which branches can render National Service are also included.

New E.C.A. Members

In the list of firms recently accepted for membership of the E.C.A. which was published in our issue of February 16th there appeared the name of H. C. Neale & Co., of 308, High Holborn, London, W.C.1. The correct title of this concern is H. Cedric Neale & Co.

Prices of Materials

Henry Gardner & Co., Ltd., report, March 6th: No change in the price of copper bars (best selected), sheet and rod, English pig lead, spelter and mercury. English block tin, £254 5s., 10s. dec.

No changes in the prices of materials were reported on March 6th, by Edward Till & Co. (india-rubber, Para fine), and F. Smith & Co. (electrolytic copper bars, wire rods and h.c. wire).

New Catalogues and Lists

Sloan Electrical Co., Ltd., "Slonetric House," 54-55, Fetter Lane, London, E.C.4.—The new "Slonetric" general catalogue has nearly 600 pages and covers the whole range of electrical equipment from wiring accessories, conduit and conduit fittings, cables, insulators, instruments and tools to motors and fans, bells, telephones, batteries and torches, iron-clad switch and fuse gear, domestic appliances, lamps, industrial fittings, decorative lighting fittings and shades, radio apparatus and special equipment for A.R.P. Accompanying the catalogue is a list giving recent price revisions.

Hackbridge Electric Construction Co., Ltd., Walton-on-Thames.—Publication D.B.23 giving particulars of type "MXCO" on-load tap-changing equipment.

Austin Walters & Son, Ltd., Ayres Road, Old Trafford, Manchester.—A leaflet relating to portable workshop model arc welders (20-250 A).

British Thomson-Houston Co., Ltd., Crown House, Aldwych, London, W.C.2.—Pamphlet L.694/F and folder L.695/F dealing with the new 80-W "Mazda" fluorescent discharge tube.

James Neill & Co. (Sheffield), Ltd., Composite Steel Works, Napier Street, Sheffield.—A folder describing the No. 1 automatic adjustable centre punch.

Electro Methods, Ltd., 15, Dartmouth Street, London, S.W.1.—Leaflets giving particulars of a new microwatt relay and "Electro-spot" electrode soldering, etc., apparatus.

Consolidated Pneumatic Tool Co., Ltd., 232, Dawes Road, London, S.W.6.—Particulars of the new ½-in. "Little Giant" heavy duty drill.

Westinghouse Electric International Co., 2, Norfolk Street, London, W.C.2.—A folder describing three new "Mobilaire" room coolers.

Autozone Co., Ltd., 18, James Street, Oxford Street, London, W.1.—A leaflet dealing with the new Autozone portable air conditioner.

Dorman & Smith, Ltd., Ordsal Electrical Works, Salford, Manchester.—List No. L.134 describing the new "Dorman Diolux" lighting fitting.

Information Department

GENERAL inquiries from readers relating to sources of electrical goods, makers' addresses, &c., are replied to by our Information Department through the post. Inquiries should be accompanied by a stamped addressed envelope.

Our extensive records enable us to reply to most queries, but occasionally we ask for our readers' assistance in tracing names and addresses not known to us. We should be glad to have such information regarding the following:—

VELVOID products.

EVERAY high frequency machine.

Automatically shorted terminal box for transformers.

ISOMA moulding machine.

ELECTRICITY SUPPLY

Burnley Loan Repayment Period. Altered Tariffs at Leicester and Wimbledon. Charges in Northern Ireland. Writ Against Rotherham Corporation.

Aberdeen.—DISTRIBUTION EXTENSIONS.—Electricity supplies in several parts of Aberdeen, and particularly in the Ferryhill area, will be helped as a result of a scheme approved by the Electricity Committee. The electrical engineer has been authorised to go ahead with the extension of a number of cables to relieve existing overloaded mains. The cost of the work is estimated at about £23,000.

Birkenhead.—RATE CONTRIBUTION.—The Electricity Committee has recommended that a sum of £8,000 should be allocated to rate relief.

SUBSTATION PLANT.—Transformer and switchgear plant at substations is to be increased at a cost of £1,670.

ABATTOIR LIGHTING INSTALLATION.—It is proposed to provide a lighting installation at Tranmere abattoir in accordance with a scheme, estimated to cost £245, put forward by the borough electrical engineer.

Burnley.—THREE-YEAR LOAN REPAYMENT PERIOD.—Subject to repayment in three years, the Electricity Commissioners have approved Burnley's application to borrow £45,000 for apparatus and £50,000 for wiring installations. The Electricity Committee, however, considers the term wholly inadequate, and if representations fail to extend the period, an interview will be sought with the Commissioners.

Cardiff.—MAINS EXTENSIONS.—Expenditure of £1,209 on the extension of mains is proposed by the Electricity Committee.

Doncaster.—SYSTEM INTERCONNECTION.—In our last issue we stated that the Council had submitted to the Electricity Commissioners for approval an agreement with the Yorkshire Electric Power Co., providing for mutual assistance during the war by interconnection of the systems of the Company and the Corporation. Actually, although a recommendation was made by the Electricity Committee on January 8th that the agreement should be submitted to the Electricity Commissioners for their approval, the matter has not yet been referred to them. We are informed that owing to circumstances which have arisen the draft agreement may have to be considerably altered with consequent delay, and it may be some little time before it is submitted to the Commissioners.

Elland.—HIRE-PURCHASE OF APPLIANCES.—The Council has agreed to renew consideration of applications for hire-purchase of electrical apparatus.

Finchley.—PROPOSED EXTENSIONS.—At a recent meeting of the Electricity Committee the electrical engineer reported that he was preparing schemes for considerable extensions of mains and plant.

Glasgow.—DISTRIBUTION EXTENSIONS.—The Electricity Committee has agreed to distributing mains being laid at a cost of £1,234.

Kettering.—TARIFF INCREASE.—After the dates of meter readings for the current quarter, the charges for electricity will be increased as follows:—Quarterly and monthly consumers: 12½ per cent. increase. Kettering Council houses: an addition of 2d. to the weekly standing charge, making it 10d., the running charge of ½d. per kWh to remain as at present. Prepayment two-part tariff meters (the type common in the Corby district): an addition of 2d. to the weekly standing charge for houses rated at not more than £18 in Kettering, £16 in Corby and other urban districts, or £13 in rural districts, with a greater increase for houses of higher rateable values; the running charge of ½d. per kWh will remain as at present. The new prepayment meter flat rates will be 7d. for lighting in Kettering and 8d. in outside areas, 1½d. for heating (all areas), and 2½d. for power (all areas).

FACTORY LIGHTING CHARGES.—The Town Council has decided not to accede to a request from Kettering & District Boot & Shoe Manufacturers' Association that there should be a reduced charge for electricity to those manufacturers who have had to use artificial light during the whole of the working hours because of the black-out. The reduction might be brought about, it was suggested, by charging the power price instead of the lighting rate.

WATER HEATING.—Discussions are taking place on the subject of substituting electric water heaters for gas geysers in Council houses.

Leicester.—ALTERED M.D. TARIFF.—Under the revised standard maximum demand tariff for combined power and light taken through a single service the fixed charge has been substantially increased, while the "unit" charge has been lowered. At present the fixed charge is 18s. 6d. per kW per quarter (measured), whereas under the new tariff it will be £20 per quarter for any demand up to 5 kW per quarter, £2 per kW for the next 45 kW, and £1 per kW for all over 50 kW. At present the running charge is 0.795d. up to 2,000 kWh per quarter, 0.575d. per kWh for the next 13,000, 0.42d. per kWh for the next 35,000, and 0.25d. per kWh for all over 50,000 kWh per quarter. This scale is superseded by one of 0.5d. per kWh for the first 15,000 kWh, 0.35d. per kWh for the next 35,000, and 0.25d. per kWh for all over 50,000 kWh per quarter. Under the existing tariff all units for lighting in excess of 30 per cent. of the quarterly power consumption are charged at the ordinary lighting rate (5d. per kWh for the first 350 kWh and 3½d. thereafter), but this clause does not appear in the new tariff.

London.—ST. MARYLEBONE.—Having had conferences with the C.E.B. and the London Power Co., the Electricity Committee recommends proposals involving an expenditure of £2,000 in respect of alternative sources of bulk supply.

STEPNEY.—It is proposed to increase the electricity tariffs by 25 per cent.

Maidenhead.—LARGE RISE IN OUTPUT.—In a report presented at the last meeting of the Town Council, it was stated that the heaviest load this winter, so far, had been 3,380 kW, as against 3,268 kW—which was looked upon as an abnormal load—in the preceding winter, but as a compensation for January's heavy load there was a record increase in output, the total of 1,351,600 kWh for the month being 37 per cent. more than a year ago.

Mansfield.—CHANGE-OVER SCHEME.—The Electricity Committee is to change over the supply system in the Nottingham Road area at a cost of £2,600.

Mid-Lincolnshire.—REQUEST FOR SUPPLY.—The South Kyme Parish Council has asked the County Council to support a request to the Mid-Lincolnshire Electric Supply Co. that it should proceed with plans for giving a supply of electricity to the village.

Northern Ireland.—COST OF ELECTRICITY.—The Minister of Commerce, in reply to a question recently in the Northern Ireland Parliament, said that the increase in the charges of the Electricity Board was due to rises in the cost of materials, increased wages, and reduced revenue through lighting restrictions. He was then asked how it was that Belfast Corporation, the producers, had not increased their prices, while the retailers, the Electricity Board, which got electricity at the cost of production, had increased the price. The Minister admitted that the Board purchased at the cost of production, but said he would need notice of the question regarding the increase.

Norwich.—PRICE INCREASE.—The City Council has adopted a recommendation of the General Purposes Committee for an increase in charges of approximately 12½ per cent. A compromise has been adopted for prepayment meters. The Electricity Committee considers that £50,000 must be raised by additional charges in the coming financial year in order to run the undertaking on sound business lines.

Oldham.—CONSUMPTION UP ON LAST YEAR.—In January sales of electricity in the area, at 10 million kWh, were nearly 19 per cent. greater than in the corresponding month of last year. The number of electric fires sold during the period was more than in any previous month.

Peterborough.—SUPPLY TO FACTORY.—Application for an electricity supply to a new works has been granted, provided the company pays the cost of the necessary cable (£2,400).

Rotherham.—WRIT AGAINST CORPORATION.—Certain questions have arisen with the Yorkshire Electric Power Co. as to the rights of that Company to supply electricity for power purposes in the urban district of Swinton. The town clerk has indicated to the Company that the view taken by the Corporation in relation to this matter is that the Company is not entitled to supply electricity in the Swinton area without the consent of the Corporation. The Company has issued a writ against the Corporation for a declaration as to the true construction of the Yorkshire Electric Power Act, 1901, the Mexborough and Swinton Tramways Act, 1905, and the Rotherham Corporation Act, 1818. The Electricity Committee recommends that the town clerk should defend the action.

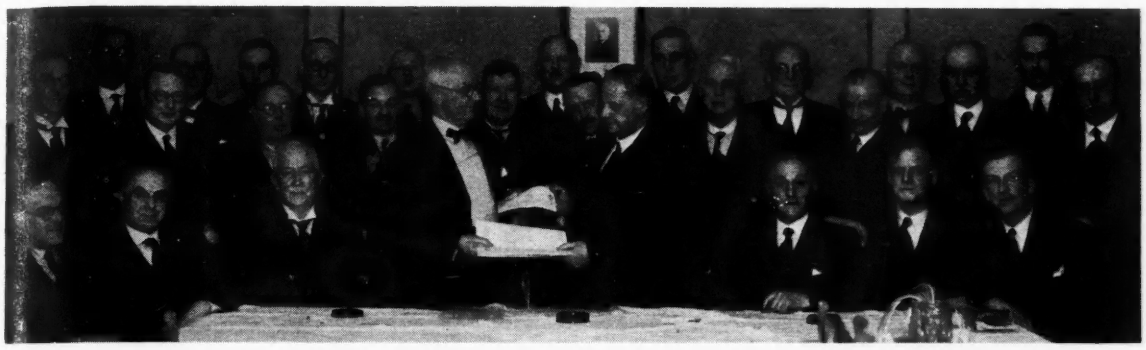
St. Helens.—RATE RELIEF.—The Electricity Committee has decided to make the maximum contribution from the profits of the electricity undertaking to the relief of the rates.

Skipton.—OVERHEAD LINES.—The Rural District Council has decided to raise no objection to applications by the Electrical Distribution of Yorkshire, Ltd., for consent to the erection of overhead lines at Cross Hills and Lothersdale.

Stroud.—OVERHEAD LINE.—The Rural District Council has approved a plan submitted by the West Gloucestershire Power Co. for the erection of a 400-V overhead line in Box Lane, Minchinhampton.

Stalybridge.—LOANS FOR DEVELOPMENT.—The Stalybridge Hyde, Mossley and Dukinfield Joint Transport and Electricity Board has obtained the consent of the Treasury to the exercise of the sanction of the Electricity Commissioners to borrow £80,000 for the acquisition of the Glossop electricity undertaking. The Commissioners have also consented to the borrowing of £23,000 for the development of the Glossop undertaking and other purposes. Application is further being made for permission to borrow £25,711 for various works in regard to distribution in the Board's area.

TRANSFER OF UNDERTAKING.—On February 23rd the Glossop undertaking of the Urban Electric Supply Co. was formally taken over by the Board, members of which visited the town and were received by the Mayor and civic officials. In the



The title deeds of the Glossop undertaking being handed to the chairman of the Stalybridge Board

speeches by representatives of the Board a promise of cheaper electricity was made, and the reductions will be operative as from the March, 1940, quarter-end readings. Mr. J. Harwood Lumsden, the chief engineer, informs us that the largest saving to any particular class of consumer will be 25 per cent., and the average for all consumers is estimated to be approximately 17 per cent.

The accompanying photograph shows Mr. E. J. Williams, of Edmundsons Electricity Corporation, presenting the title deeds of the Glossop undertaking to Alderman J. Buckley, chairman of the Stalybridge Board, who in turn is handing over a cheque in payment. Mr. J. Harwood Lumsden, the Board's chief engineer, is in the back row (right hand of framed photograph). In the middle row (extreme left) is Mr. A. G. Grundy, the Board's transport manager, and fourth from the left is Mr. T. L. Podmore, engineer and manager of the Glossop Co. Seated on the extreme right is Mr. C. T. Arnett, manager, N.W. Area, C.E.B.

West Bromwich.—BULK SUPPLY CHARGES.—The Electricity Committee reports that the West Midlands Joint Electricity Authority has decided to impose a coal adjustment increment of 0.04d. per kWh, leaving the bulk supply tariff unaltered in other respects. The Committee regards this increase as very reasonable.

Wimbledon.—TWO-PART TARIFF REVISION.—In the recent test case, Attorney-General v. Wimbledon Corporation, it was shown that in certain cases of abnormally large consumption under the domestic two-part tariff the supply, with a fixed charge on the general basis, might be uneconomic. The Corporation has now notified all two-part tariff consumers that their agreements will be terminated at the end of the March quarter, when a revised tariff will be offered as an alternative to the flat rates. Under the new conditions a maximum consumption is assigned to each step of the fixed-charge scale. Thus for houses or flats with a floor area up to 900 sq. ft. the annual fixed charge will be £2 1s., and the maximum consumption for each winter quarter 1,025 kWh. The scale rises up to houses of from 2,101-2,200 sq. ft., with an annual fixed charge of £4 15s. and a maximum consumption in each winter quarter of 2,375 kWh. Thereafter, for each additional 100 sq. ft. or part, 3s. 6d. is added to the fixed charge and 87½ kWh to the maximum consumption. The fixed charge in each winter quarter will be increased at the rate of 1s. for every 100 kWh consumed in excess of the maximum figure.

Scandinavian Radio Notes

(From Our Copenhagen Correspondent)

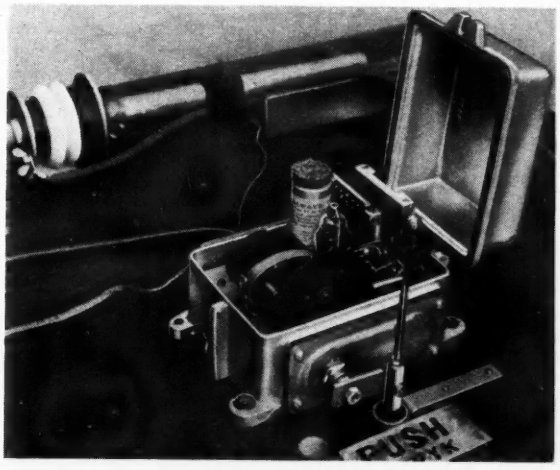
THE life-saving rafts which all Danish seagoing merchant ships are compelled to carry have the disadvantage that they are hard to sight from other ships, and several instances have already occurred of Danish sailors drifting in the North Sea for up to four days, some dying from cold or starvation. This has led a Danish firm, A/S Wilhelm Johnsen, Copenhagen, to produce a new commercial radio device marketed under the name of "Raft Radio."

The installation consists of two 10-ft. steel-rod aerials (one for each side of the raft), a large-capacity 6-V battery of dry cells mounted in a watertight case flush with the raft surface, and a one-valve midget transmitter operating with an aerial output of 10 W. The transmitter requires only one battery which feeds the filament, a vibrator-transformer delivering 350 V on the anode, and a 6-V electromotor driving an indented contact disc for the SOS signal. The whole set is completely automatic and foolproof, being started by a single push-lever. It can operate with full output for ten hours and continue with reduced signal strength for a further 5 to 10 hours. The transmitter is permanently tuned to the conventional distress-call frequency of 500 kc/s and tests carried out under the supervision of Danish Post Office engineers have established a range of up to 40 miles over water.

The complete installation is sold at the equivalent of £42 10s., ex works. A simplified model with one aerial and an accumulator battery of 65 Ah is available at £32 15s. for installation in lifeboats. A proposal to make such equipment compulsory for all Danish merchant ships engaged in foreign trade is being considered by the Ministry of Commerce and Shipping.

New legislation is being prepared in Denmark under which all who carry out radio servicing must qualify for a licence. It is proposed to fix four years as the term of apprenticeship, which would be followed by one year's employment as "journeyman radio mechanic."

A new marine telephone cable is being provided between Elsinore and Helsingborg, Sweden. A scheme to lay another marine cable across the Kattegat from Jutland to West Sweden has been abandoned on account of the war. Instead, two



Automatic transmitter for Danish life-saving rafts

ultra-short-wave beam transmitters, estimated to cost 50,000 kr. each, will be erected at Frederikshavn and Göteborg.

The Finnish broadcasting stations are continuing to operate despite the activities of Soviet bombers. Although the latter have been doing their best to silence the transmitters, only one station has sustained serious damage, namely, the long-wave transmitter at Lahti. The broadcasting stations have been equipped with bombproof shelters and control rooms.

NEW PATENTS

Electrical Specifications Recently Published

Compiled by a firm of chartered patent agents. The numbers under which the specifications will be printed and abridged are given in parentheses. Copies of any specification (1s. each) can be obtained from the Patent Office, 25, Southampton Buildings, London, W.C.2.

1938

9206. "Rubber compositions." Standard Telephones & Cables, Ltd. April 14th, 1937. (517761.)

9566. "Earthing conductors for electrical systems." Liverpool Electric Cable Co., Ltd., and R. F. D. Milner. March 29th, 1938. (517762.)

13002. "Welding machines." Barton Conduits, Ltd., W. Holy and A. Prichards. May 5th, 1939. (517714.)

31351. "Electrical devices for indicating or determining distances and the like." K. Secretan and J. Horsfall. May 3rd, 1938. (Cognate application 24879/38.) (517810.)

13157. "Amplifier for television system." Philco Radio & Television Corporation. May 25th, 1937. (517666.)

13194. "Illuminating devices." Naamlooze Vennootschap Philips' Gloeilampenfabrieken. May 4th, 1937. (517715.)

13697. "Remote-control and indicating systems for radio direction finders." F. J. Cleveland (Bendix Aviation Corporation). May 7th, 1938. (517860.)

13698/9. "Radio direction finding." F. J. Cleveland (Bendix Aviation Corporation). May 7th, 1938. (517861/2.)

15171. "Electric condensers." S. G. Brown. June 21st, 1939. (517718.)

15573. "Colliery trailing cables." Liverpool Electric Cable Co., Ltd., and J. T. Frost. May 25th, 1938. (517765.)

15893. "Thermally actuated electrical cut-outs." W. C. Winn. May 26th, 1939. (517719.)

15930. "Train-describing equipment." Standard Telephones & Cables, Ltd., J. B. Griffiths and A. Brown. May 27th, 1938. (517766.)

16643. "Radio landing systems for aircraft." W. H. A. Thiemann (Bendix Aviation Corporation). June 3rd, 1938. (517667.)

16998. "Electrically operated latches and locks." S. C. Cox. May 30th, 1939. (517863.)

18910. "Electric clock." F. Loeffler. June 25th, 1937. (517728.)

19094. "Aerials or aerial systems" C. E. Cork and J. L. Pawsey. June 28th, 1938. (517772.)

19517. "Mercury-tube switches." A. F. Burgess (Adlake Co.). July 1st, 1938. (517730.)

22756. "Automatic control for vehicle lights." W. M. Baker. July 30th, 1938. (517737.)

22808. "Rectifiers for supplying DC voltage to a radio receiving set from an AC supply." General Electric Co., Ltd., and D. C. Espley. August 2nd, 1938. (517815.)

22939. "Thermionic valves and circuit arrangements therefor." Standard Telephones & Cables, Ltd., and F. D. Goodchild. August 3rd, 1938. (517671.)

22957. "Flameproof packing glands." General Electric Co., Ltd., S. W. Richards and H. Worrall. August 3rd, 1938. (Cognate application 33993/38.) (517781.)

22963. "Electric control systems for dynamo-electric synchronous machines." British Thomson-Houston Co., Ltd. August 5th, 1937. (517676.)

22973. "Arc lamps." M. W. Dietrich. August 10th, 1937. (517678.)

22983. "Magnetic lenses for electron-beam apparatus." Fides Ges. für die Verwaltung und Verwertung von Gewerblichen Schutzrechten. August 16th, 1937. (517680.)

22988. "Electrical generators." Auto Union Akt.-Ges. August 3rd, 1937. (517681.)

22993. "Electric batteries." J. Pellini. August 4th, 1937. (517683.)

23106. "Independent simultaneous telegraphy and telephony systems." Transmissions Loth-Havas. August 6th, 1937. (Cognate application 23107/38.) (517788.)

23208. "Telegraph transmitters." Creed & Co., Ltd., and R. D. Salmon. August 5th, 1938. (Addition to 454593.) (517701.)

23209. "Automatic switches used in telephone or like systems." Automatic Telephone & Electric Co., Ltd. August 5th, 1938. (517702.)

23222. "Electron microscopes." Fides Ges für die Verwaltung und Verwaltung von Gewerblichen Schutzrechten. August 17th, 1937. (517704.)

23293. "Navigation-aiding radio systems." Marconi's Wireless Telegraph Co., Ltd. September 24th, 1937. (517826.)

23310. "Electric-discharge tubes comprising secondary-emission electrodes." Naamlooze Vennootschap Philips' Gloeilampenfabrieken. August 9th, 1937. (517743.)

23364. "Trolley retrievers for trolley-buses, tramcars, and other vehicles employing collectors in contact with an overhead wire." R. Livingstone, and Anti-attrition Metal Co., Ltd. August 8th, 1938. (517832.)

23382. "Adjustment mechanism, more particularly for electrical apparatus such as time switches, variable condensers, and the like." T. F. Caldwell. August 8th, 1938. (517836.)

23391. "High-tension transformers." Brown, Boveri & Cie. August 7th, 1937. (517838.)

23396. "Circuit arrangements for generating oscillations of sawtooth waveform." Fernseh Akt.-Ges. August 7th, 1937. (517839.)

23412. "Radio aerial systems." Marconi's Wireless Telegraph Co., Ltd., and O. Bohm. August 8th, 1938. (517840.)

23627. "Radio receiving devices." Aga-Baltic Radio Aktiebolag. August 10th, 1937. (517845.)

23705. "Vapour electric convertors." General Electric Co., Ltd., and E. Gallizia. August 11th, 1938. (517849.)

23813. "Mercury-vapour electric-discharge devices having metal envelopes." General Electric Co., Ltd., D. H. Donaldson and D. A. Wright. August 12th, 1938. (Cognate application 16799/39.) (517854.)

23817. "Discharging of electricity from materials used in industries." English Electric Co., Ltd., and W. E. M. Ayres. August 12th, 1938. (517855.)

24003. "Television and like receivers." Baird Television, Ltd., and C. E. Mautland. August 15th, 1938. (517888.)

24018. "Devices for protecting the contents of shop windows against ultra-violet rays." R. Konitz and L. Fantl. August 14th, 1937. (517889.)

24814. "Electric traction-control equipments." G. R. Higgs, W. T. Gray, and Metropolitan-Vickers Electrical Co., Ltd. August 23rd, 1938. (Cognate application 31158/38.) (517898.)

25130. "Electric contact-making devices, particularly for fuses and links." Callender's Cable & Construction Co., Ltd., and C. V. H. Garnett. August 26th, 1938. (517903.)

25670. "Indicators for electric cartridge fuse links." Lawson Beck, Ltd., and A. J. A. Beck. September 2nd, 1938. (517905.)

27994. "Interference-suppression circuit for radio receiving apparatus." Magyar Wolframplampa Gyar Kremenezky Janos R.T. September 24th, 1937. (Cognate application 27995/38.) (517909.)

1939

4616. "Cathode-ray devices." Electrical Research Products, Inc. February 19th, 1938. (517756.)

14762. "Apparatus for the reproduction of sound films." O. K. Kolb. May 17th, 1939. (Addition to 501218.) (517803.)

24687. "Electron multiplier device." Radioakt. Ges. D. S. Loewe. February 16th, 1937. (Divided out of 512711.) (517806.)

Guide to the I.E.E. Regulations

WITH a view to making the I.E.E. Regulations more readily understandable by working electricians, the Association of Supervising Electrical Engineers has brought out a pocket-size Guide (of 208 pages) to the Eleventh Edition, as it did in the case of the two previous editions. The net price is 1s. 3d., paper bound, or 1s. 9d., cloth bound, from the Association at Aldwych House, W.C.2.

In the Guide only those regulations that are of direct interest to the operative have generally been included; i.e., matters relating to schematic design and materials have in most cases been left out. Where necessary for easy reading the wording has been simplified (such variations being indicated) and cross references and B.S.S. numbers that are of no practical use to the operative have been omitted. Definitions that are unlikely to convey useful information to the skilled wireman have been omitted.

Nearly thirty diagrams have been added as well as a large number of practical explanatory notes. Items of special interest have been emphasised by underlining. Among the diagrams, those following No. 116, relating to the protection of conductors where a change in cross section occurs. No. 201 (A) showing the distinction between "circuit" and "sub-circuit" and No. 1102, illustrating the difference between wiring points and outlets, should be especially useful. The same remark applies to the table introduced in No. 312 (A) showing the diameters of bores for cable sockets to take various sizes of conductors.

Examples of useful notes are to be found at the end of No. 107 (B), where attention is drawn to the risks of including main control gear with gas meters in small enclosed spaces, of No. 607 (B), reminding the reader that lampholder plugs may not be used for more than 1A (instead of the 2A allowed under the tenth edition) and of No. 1003 regarding the high resistance caused in conduit joints by the use of certain types of paint. Regulation No. 1002 (A) concerns bathrooms and is therefore of the greatest importance to safety, but the wording of the long original paragraph, though logical enough, would hardly appeal to the average operative; the A.S.E.E. version is a distinct improvement in this respect.

The A.S.E.E. index to current rating of cables in Tables 5 to 12 has been brought up to date and once more incorporated in Section 14 and notes have been added to the tables showing how these differ from those in the Tenth Edition.

FINANCIAL SECTION

New Companies. Returns of Capital. Debenture Charges. Bankruptcies and Liquidations. Reports of Electrical Companies. Dividend Announcements. Stocks and Shares

New Companies Registered

Mylan & Smith (Engineers), Ltd.—Private company. Registered February 23th. Capital, £1,000. Objects: To acquire the business of electrical, mechanical, civil and constructional engineers lately carried on by Mylan and Smith (Engineers), Ltd. (now in voluntary liquidation), at 127, Bradfield Road, Sheffield. The subscribers are: H. Whiting, Richmond Park, Kimberworth; and J. C. Shaw, 32, Oakwood Drive, Rotherham. Secretary: J. C. Shaw.

Knight's (Hendon), Ltd.—Private company. Registered February 29th. Capital, £100. Objects: To effect and install systems of electrical heating for buildings and houses; to carry on the business of heating engineers, factors and dealers, electrical contractors, electrical, television and wireless manufacturers, &c. The subscribers are: E. Westbrook and J. Buchanan, both of 14/18, High Holborn, W.C.1. Solicitors: Westbrook & Co., 14/18, High Holborn, W.C.1.

W. Cooper (Grimsby), Ltd.—Private company. Registered March 1st. Capital, £5,000. Objects: To carry on business as heating and constructional engineers and specialists, ventilating, lighting, electrical, radio, automobile and aviation engineers, &c. W. Cooper, 94, Wellsby Road, Grimsby, is permanent managing director.

South Coast Wireless Rentals, Ltd.—Private company. Registered February 17th. Capital, £100. Objects: To carry on the business of manufacturers, importers and exporters of, agents for and dealers in radio and television sets and radio, television, telegraphic, telephonic, electrical, magnetic, galvanic and mechanical apparatus, &c. Permanent directors: Edwd. M. Lear, "Sunray House," Meadow Way Estate, Bracknall, Berks; and Leslie C. Beaver, Steyning Mansions, Brighton. Registered office: 12, Bath Place, Worthing.

Aerolectric Mouldings, Ltd.—Private company. Registered February 24th. Capital, £300. Objects: To carry on the business of manufacturers of, agents for and dealers in plastic materials of all kinds; and that of aeronautical, electrical, mechanical, motor, constructional and civil engineers, contractors, builders and decorators. &c. Directors: C. E. Wakeling, 3, Serjeants Inn, E.C.4; D. Gonda, 11, Nevern Square, S.W.5; and Mrs. V. Hollander, 310, Regent Street, W.1. Registered office: 3, Serjeants Inn, Temple, E.C.4.

Companies' Returns

Statements of Capital

Holophane, Ltd.—Capital, £100,000 in 100,000 shares of £1 each. Return dated October 13th, 1939. 100,000 shares taken up. £7 paid. £99,993 considered as paid. Mortgages and charges, nil.

Peterborough General Electric Co., Ltd.—Capital, £500 in 500 shares of £1 each. Return dated November 20th, 1939. 500 shares taken up. £500 paid. Mortgages and charges, nil.

Willet & Robinson, Ltd.—Capital, £7,000 in 3,000 "A" cumulative preference, 1,000 "B" non-cumulative preference, and 3,000 ordinary shares, all of £1. Return dated January 1st, 1940. 3,000 "A" preference and 3,000 ordinary shares taken up. £8,000 paid. Mortgages and charges, £8,390.

Barlow-Whitney, Ltd.—Capital, £5,000 in 2,500 7½ per cent. cumulative preference and 2,500 ordinary shares of £1. Return dated January 2nd, 1940. 600 preference and 1,850 ordinary shares taken up. £2,150 paid on 600 preference and 1,550 ordinary shares. £300 considered as paid on 300 ordinary shares. Mortgages and charges, nil.

Barbados Electric Supply Corporation, Ltd.—Capital, £200,000 in £1 shares. Return dated January 4th, 1940. 140,000 shares taken up. £78,051 paid, £61,949 considered as paid. Mortgages and charges, nil.

Mortgages and Charges

Dicona, Ltd.—Satisfaction to the extent of £1,500 on May 19th, 1938, of debenture registered November 24th, 1933. Notice filed February 19th, 1940.

L. Adams, Ltd.—(a) First mortgage debenture, dated February 15th, 1940, to secure £11,500, charged on land and factory in Minerva Road, Acton. (b) Charge of same date on land and factory in Minerva Road, Acton, and land in rear, as collateral security to above. Holders: Peoples Bank, Ltd., Bentinck Buildings, Wheeler Gate, Nottingham.

Spero Electrical Company, Ltd.—Debenture charged on the company's undertaking and property, present and future, including uncalled capital, dated February 20th, 1940, to secure £2,500. Holders: Vale Royal Electric Lamp Manufacturing Company, Ltd., 52, Lawrence Road, N.15.

Private Telephone and Electric Co,. Ltd.—Debenture dated February 22nd, 1940, to secure £350, charged on the company's property, present and future, including uncalled capital, and ranking in priority to debenture dated February 11th, 1937. Holder: H. R. Morgan, 51, Beech Hill Road, Eltham, S.E.9.

J. & N. Wade (London), Ltd.—Debenture charged on the company's undertaking and property, present and future, including uncalled capital, dated February 19th, 1940, to secure £1,000, and ranking *pari passu* with existing debentures. Holders: Branch Nominees, Ltd.

Receiver Released

Associated P.A. Equipments, Ltd.—Edward M. B. Gordon, of 36, King Street, E.C.2, ceased to act as receiver on February 10th, 1940.

Company Liquidations

Herts Radioelectric, Ltd., radio and electrical engineers, Sun Street, Hitchin.—The statutory meeting of creditors was held on February 19th at the offices of the Allied Traders Association, Finsbury Chambers, 76, Finsbury Pavement, London, E.C. Mr. G. A. Gray, one of the directors, presided and reported that the usual resolution had been passed for the voluntary liquidation of the company and Mr. A. E Attwood had been nominated as liquidator. The statement of affairs showed liabilities totalling £3,827 and net assets of £682, leaving a deficiency, as regarded the creditors, of £3,145. It was decided that the voluntary liquidation of the company should be continued with Mr. Attwood as liquidator.

Harris & Campbell, Ltd., Grosvenor Parade, Ealing Common, London, W.5, electrical engineers, etc.—A meeting of creditors was held recently, when a statement of affairs was submitted showing ranking liabilities of £1,396, including a cash claim of £1,690. The net assets were £137, leaving a deficiency, as regarded the creditors, of £1,758. The issued capital was £200, and so far as the shareholders were concerned there was a deficiency of £1,958. The creditors decided that the voluntary liquidation of the company should be confirmed with Mr. G. Bryant, of 23, Bush Grove, Stanmore, and Mr. H. Goodier, C.A., of Morgan & Co., 11, Argyll Street, London, W., as joint liquidators.

Surrey Wholesale Electrical, Ltd.—Meeting March 29th at 62, Great Russell Street, London, W.C.1, to receive an account of the winding up by the liquidator, Mr. A. E. Sharman.

Hough Electric Motor Co., Ltd.—Meeting March 28th at 231, Drake Street, Rochdale, to receive an account of the winding up by the liquidator, Mr. W. Dobbs.

Springvale Electrical Co., Ltd.—Particulars of claims by March 30th to the liquidator, Mr. E. E. Osmond, 2, Oakmead Gardens, Edgware, Middx.

Electric Standard Lamp Co., Ltd.—Particulars of claims by March 30th to the liquidator, Mr. H. S. Grant, 2, Cross Lane, Salford.

Bankruptcy Proceedings

E. C. Johnson & J. A. Sheward, carrying on business in co-partnership under the style of Edstan Electric, 20, Market Street, Hanley, Stoke-on-Trent, and 40, London Road, Newcastle-under-Lyme, Staffs., electrical contractors.—The public examination was held recently at the Town Hall, Hanley, Stoke-on-Trent, when a statement of the joint affairs disclosed ranking liabilities of £3,373, against assets of £107, leaving a deficiency of £3,268. The failure was attributed to losses on contracts. The examination was closed.

C. H. A. Sanders (Sanders Electric & Radio Service & Supplies), radio dealer, 231, Staines Road, Hounslow, Middx.—Last day for receiving proofs for dividend March 13th. Trustee, Mr. J. L. Poland, 29, Russell Square, London, W.C.1.

F. Durant & W. Kearns (Durant & Kearns), radio dealers, lately trading at 68a, Bruce Grove, Tottenham, Middx.—First meeting March 8th at 29, Russell Square, London, W.C.1. Public examination March 19th at the Court House, Edmonton, N.9.

G. A. Wood, electrical engineer, 129, Bolton Road, Darwen.—Trustee, Mr. H. S. Haworth, 7, Lord Street West, Blackburn, Official Receiver, released February 23rd.

G. C. Pinnoy and **A. E. Miller** (Granby Service Co.), wireless and electrical dealers, 4, Granby Street, Littleport.—Last day for receiving proofs for dividend March 15th. Trustee, Mr. F. E. Bendall, 4, Charterhouse Square, London, E.C.1.

J. C. De Wardt (De Wardt Radio), radio and electrical engineer, 10, Windmill Street, Gravesend.—Last day for receiving proofs for dividend March 18th. Trustee, Mr. A. H. Partridge, 3, Warwick Court, Gray's Inn, London, W.C.1.

Reports and Dividends

The Midland Counties Electric Supply Co., Ltd., held its annual meeting on March 1st, when Mr. G. Balfour (chairman), who presided, said that they considered the report and accounts as satisfactory. Indeed, but for the prevailing war conditions and the very uncertain outlook, he would have been in a position to indicate some reductions in charges to various classes of electricity consumers of their subsidiary companies. Meantime, it was satisfactory to know that they had not found it necessary to increase any of the subsidiary companies' charges. Dealing with their transport undertakings, he said they had disposed of the investment in the Cheltenham property which was the only transport undertaking operating in an area isolated from all their other transport business. They had now a group of consolidated transport properties, all interconnected and operating 330 vehicles over 520 route miles.

Turning to the business of their electric lighting and power properties, he said that these had made steady progress up to the outbreak of war. Since that date the rate of expansion had naturally decreased, but a large number of connections continued to be made. During last year they extended their high-voltage transmission lines by 85 miles, and laid 144 miles of low-voltage distribution, making a total of 1,956 miles of high-voltage lines and 2,433 miles of low-voltage lines or cables in service at the end of last year. They also added

130 substations or transforming units, making a total of 1,908 now in service.

Their services at the end of last year were available in four boroughs, thirty urban districts and 672 parishes. Last year they maintained a satisfactory rate of connections for the first half-year, but during the last half-year the number of connections materially diminished. The total number of connections for the year, including six additional street lighting supplies, was 10,906, and the total number of consumers connected at the end of the year was 161,576.

The generating stations, with an aggregate plant capacity of 150,000 kW, were all operated satisfactorily throughout the year, and together with the supplies purchased from outside sources, dealt with a simultaneous demand of 121,200 kW in December last. The total kWh generated and purchased amounted to 582.8 millions, which included a net export to the Central Electricity Board of 33.3 millions. They sold 490.2 million kWh, an increase of 58 millions.

The Metropolitan Electric Supply Co., Ltd., held its annual meeting on Tuesday last, when Mr. G. Balfour, chairman, who presided, said that while they started the year under review with a feeling of the possibility of steady and undisturbed progress this had been rudely interrupted by evacuation, followed by the outbreak of war, and it was with regret that, owing to the rapid effect of the changed conditions on a considerable portion of their business, they had been compelled to increase their charges. This effect was not, perhaps, so great with regard to their subsidiary companies and part of the western area, but in other parts of this area and in London the evacuation and the black-out had created a serious situation. This was mainly felt in the Notting Hill district.

In their London area, Paddington and mid-London, during the first half-year there was an increase of 8.1 per cent. in kWh sold and 4.3 per cent. in revenue as compared with the first six months of 1938, but in the second half-year there was a decrease of 21 per cent. in kWh and 13.7 per cent. in revenue, again compared with the like period in 1938, the total decrease compared with normal conditions being 27 per cent. In the Notting Hill area the position was even more serious. During the first half-year the kWh sold increased by over 10 per cent. and the drop in revenue of 1.3 per cent. only reflected, as anticipated, the decrease in tariffs made in September, 1938. In the second half-year, however, the kWh sold fell by 25.7 per cent., averaged over the six months, and the revenue by 20 per cent. There was a fall of over 40 per cent. in kWh sold in November and December, and the actual decrease, compared with normal conditions, amounted to 32.7 per cent. in the last half-year. Their bulk supply to other authorities also showed a decrease of 17 per cent. on the normal of anticipated demand.

Business in the first half of 1939 in the London and western areas and subsidiary companies progressed at a normal rate and the 11,841 new consumers connected, compared with 14,670 in 1938, brought the total consumers connected at the end of December last to 213,376, of whom 10,000, whose premises were still connected, had ceased to be "live" consumers. This was in addition to the initial rationing, black-out, etc., the effects of which were still being felt. At the commencement of evacuation and war the business-getting department was damped down and they readjusted their capital expenditure programme so as to conserve capital resources to the maximum possible extent.

In addition to the connections made in 1939, supplies were taken by 940 consumers under the assisted wiring arrangement, bringing the total connections in that class to 10,500. The sales and hire section of their business made good progress and included an additional 6,255 pieces of apparatus, making a total of such appliances on hire of 52,550. Sales of the parent company and its subsidiaries amounted to 350 million kWh, compared with a forecast consumption of 405 million kWh.

London Electric Supply Corporation, Ltd.—Speaking at the annual general meeting on Tuesday Mr. O. R. H. Bury, chairman, said that the year 1939 was abnormal. In the first eight months the board continued its policy of endeavouring to increase the demand for power, lighting, heating, cooking and water heating by offering to consumers every facility to make use of electricity for those purposes, and this policy was justified, as the sale of electricity (excluding traction and bulk supplies) until the end of September (which included one month of the war period) was almost 9 per cent. in excess of the first nine months of the year 1938. The last four months of the year showed a serious decline, the falling off in consumption being attributable to lighting restrictions and the evacuation of a large number of residential consumers. In 1938 and the early part of 1939 prices were reduced and the full effect of such reductions were experienced in last year's revenue. Costs rose rapidly during the last four months of the year, and the combined effect of the reduction in prices and increased costs materially lessened the profit for the year.

Clarke, Chapman & Co., Ltd.—Presiding at the annual meeting held on March 1st, Mr. W. A. Woodeson (chairman) said that the figures for the year under review were satisfactory and their financial position was stronger and sounder than it had ever been. They had an excellent order book again, and during the last few months had booked orders for steam and electric winches, windlasses and capstan gears, water tube boilers and accessories, pumps and pulverising plant. During the last eighteen months they had had a better export trade than for several years past. They started the past year with an order book of £1,600,000 and turned out practically 1½ millions' worth during 1939. In spite of doing this their order book was increasing, and it stood to-day at nearly £2,500,000. Shipbuilding had taken a turn for the better and they were busy in all departments this year.

The Northmet Power Co. reports a net revenue for 1939 of £898,854, as compared with £980,816 in the preceding year, to which is added £100,000 transferred from contingency account and £76,412 brought forward, making £1,075,267. After providing for mortgage, debenture and other interest, allocations to debenture stock redemption funds and placing £415,446 to depreciation and reserve, there is a balance of £528,986. The ordinary dividend for the year is maintained at 10 per cent. by a final distribution of 6 per cent., and £75,094 is carried forward. Prior to the outbreak of war the company's revenue showed a satisfactory increase, but it has since been adversely affected by the war, and operating costs have increased. The capital expenditure during the year, mainly upon plant, machinery, buildings, and trunk and distributing mains, amounted to £836,639. and the total capital expenditure at December 31st was £12,257,562.

Approximately 240 miles of underground mains were laid and 29 miles of overhead lines were erected during the year. The length of underground mains and overhead lines at the end of the year, including 307 miles of the Hendon undertaking, was 4,348 miles. New substations put into service numbered 69 and 140 substations were acquired from the Hendon Co., making a total of 1,248 in service. Electricity supplied during the year was as follows:—Company's distribution undertakings, 381.1 million kWh; other authorised distribution undertakings, 192.9 million kWh; industrial power, 147.1 million kWh; traction, 93.3 million kWh; and Central Electricity Board, 18.2 million kWh. The total for 1939 was 832.6 million kWh, as against 759.5 million kWh for 1938.

The number of consumers supplied directly and indirectly by the company at December 31st was 419,493, as compared with 407,106 in 1938. The consumers of the Hendon undertaking (now vested in the Northmet Co.) now receive supplies direct, and the number of consumers, including the Hendon undertaking, at December 31st was 325,979, as compared with 277,010 in 1938. The L.P.T.B. began to take a supply for the electrified lines of the L.N.E.R. to Highgate and East Finchley in June last. Altogether, 806 additional street lamps were put into operation, bringing the total to 15,265. Meeting: March 12th.

The North Metropolitan Power Station Co. reports that the rent received for 1939, less tax, was £121,438, as compared with £99,525, plus miscellaneous revenue of £3,061. The dividend on the £100 ordinary stock is 6 per cent. (same). The capital expenditure during the year amounted to £481,940, and after deducting the cost of plant written off the total capital expenditure at December 31st was £2,955,189. The Willesden station has been purchased from the Northmet Power Co. and has been leased back to that company. In accordance with the direction by the Central Electricity Board the station is being reconstructed. To provide for the cost of the acquisition and reconstruction of the Willesden station and to complete additional works at the Brimsdown stations an issue of £1,700,000 3½ per cent. second mortgage debenture stock, 1965, was made in June, 1939.

The Midland Electric Manufacturing Co., Ltd., reports a trading profit for 1939 of £45,811, as compared with £50,773 in the preceding year, which with bank and investment interest and rents and transfer fees makes £49,384. General reserve again receives £20,000, and the ordinary dividend for the year is 10 per cent., plus a bonus of 15 per cent. (same). The balance carried forward is £32,524 (against £31,721 brought in).

Enfield Cable Works, Ltd., reports a trading profit for 1939 of £192,553, as against £195,742 for the preceding year, and investment income of £15,657, making £208,210. After providing for board fees, depreciation and A.R.P., there is a balance of £180,603 (£185.250). Appropriation for taxation is £25,000, including N.D.C. £10.000. and the final ordinary dividend is 10 per cent., maintaining the distribution for the year at 16 per cent. The balance carried forward is £30,293 (against £19,690 brought in).

The British Power and Light Corporation reports that dividends and interest received from subsidiary companies for 1939, plus other interest and sundry receipts, amounted to £260.379, as compared with £233.295 for 1938. The net profit, after taxation, is £163,016 (against £154,728). The final ordinary dividend is 5 per cent., making 7 per cent. for the year (same) and £83,378 is carried forward (against £74,573 brought in).

The North Wales Power Co. reports a net profit, before tax, for 1939 of £154,178, as compared with £164,730 for the preceding year, to which is added £3,315 profit on sale of investments, &c. Taxation requires £50,000, goodwill written off £710, and A.R.P. expenditure written off £3,316. A sum of £10,000 is placed to contingencies reserve, and the dividend for the year is maintained at 7 per cent. The balance carried forward is £12,501 (against £10,034 brought in).

The City of London Electric Lighting Co. reports a net revenue for 1939 of £103,759. as compared with £153.002 for 1938. The ordinary dividend for the year is maintained at 7½ per cent., less tax, and £106.009 is carried forward (against £111.451 brought in). The sales of electricity amounted to 135.8 million kWh, a decrease of 11 million kWh as compared with 1938.

The Llanelly & District Electric Supply Co., Ltd., reports a net profit for 1939 of £79.314, as compared with £83,160 in the preceding year. Depreciation and general reserve receives £35,304, and the ordinary dividend for the year is maintained at 5½ per cent. The balance carried forward is £1,140 (against £1,980 brought in).

The Scottish Power Co., Ltd., reports that the trading profits for 1939 of undertakings owned, including £18.903, interest charged to capital during the construction of the Grampian Co.'s hydro-electric works, and miscellaneous receipts, amounted to £791,234, as compared with £747.309 in the preceding year. The revenue received by the parent company was £396.799 (against £410.226), and the net profit is £358,322 (£372,103). Reserve receives £35,000, and the final ordinary dividend is 5½ per cent., making 8 per cent. for the year (same). The balance carried forward is £12,131 (against £11,209 brought in).

The Farnham Gas & Electricity Co. reports a net revenue for 1939 from its electricity undertaking of £19,563, as compared with £18.865 for 1938, and £13.985 (against £13,507) from its gas undertaking. The final ordinary dividend is 4 per cent., making 7 per cent. (same) and £7,960 is carried forward (against £7,319 brought in).

G. D. Peters & Co., Ltd., report a net profit for 1939 of £128,793, an increase of

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STOCKS AND SHARES

TUESDAY EVENING.

THE long-expected terms of the new Defence Loan are now published. The first effect was to improve the prices of the War Loan and a few other British Government stocks. Announced after the close of Stock Exchange markets this, Tuesday, evening, the news has not yet influenced, of course, the general markets. That the new loan will be popular with investors is a safe assumption, although its terms are calculated with such precision that the Treasury may be absolved from any charge of making the loan too cheap. Debenture stocks and preference shares are likely to gain appreciation in price, for the newcomer sets a high standard of value, a modest measure of yield.

Gilt-edged

As a batsman proceeds cautiously in the nervous nineties, so the War Loan hesitated before crossing the fractional gap of 5s. which separated the quotation from the century mark. There will be general surprise if three figures are not attained this week. The price did not reach 99 last year, but it was up to 104 in 1938. Few people are willing to put a short limit to the scope which remains for the prices of gilt-edged securities. Stock is scarce, and money plentiful. A home must be found for a fresh access of funds from the requisitioned dollar stocks, and, later, from the repayment of part of the redeemed 4½ per cent. Conversion Loan. Much of this will find its way into the new loan: a good deal, also, into Stock Exchange markets. A purchase liberates a corresponding amount of money into the hands of the seller, who remains with the problem of its reinvestment. With the field of investment restricted by the ban on new issues and the purchase of foreign holdings, a fine head of steam is created for the further advancement of prices. Central Electricity Board issues have been marked up about a point further, but little fresh stock has been tempted out. A fall of 4 points in London Passenger Transport "B" stock is difficult to account for: the Board's "C" stock, down 1½ at 46, has been sold by holders who prefer an investment with higher dividend potentialities.

More Electricity Results

While containing no surprises, this week's batch of dividends and reports from Home electricity supply companies came up to the satisfactory standard of the news already published by other of the London and provincial undertakings. Bournemouth & Poole provided the justification for the recent strength of the shares in maintaining the dividend at the equivalent of 15 per cent. Llanelly & District is again paying 5¼ per cent. out of profits which are reduced, by taxation, to a little below the previous year's. The full accounts of one or two others confirm that electricity profits in 1939, after allowing for the extra taxation, generally contracted to some small extent, although seldom enough to jeopardise the regular rates of dividend. Scottish Power subsidiaries made higher trading profits, but handed on a slightly reduced amount of revenue to the parent concern. Despite the new preference shares ranking for dividend, the company is able easily to maintain the dividend on the ordinary at 8 per cent. while bringing up the reserve funds to well over a million pounds. Northampton Electric profits show a small decline—after increased taxation—and the dividend is again 10 per cent.; the previous distribution was increased by a special jubilee bonus of 1 per cent. Net revenue of Notting Hill Electric, which paid only the interim dividend on the preference shares, is shown to be £12,000 down at £39,000.

Midland Counties Meeting

The yield of less than 4¼ per cent. on Midland Counties Electric shares at the current price suggests that this company is ranked by the market among the companies so placed as to be able to make the best of wartime conditions. Although, therefore, they may not admit of general application, reassurance will nevertheless be found in Mr. George Balfour's words at last week's annual meeting to the effect that earnings in the opening weeks of the year had proved satisfactory, and could be expected to continue so unless, of course, business became subject to greater disturbance than has been the case up to the present. The outbreak of war put the brake on the Company's expansion, though it has not, apparently, altogether put a stop to progress. But for the war, the Company would have been in the satisfactory position of being able to reduce electricity charges in some directions. Nevertheless, it has not been found necessary to raise prices. The intention to separate the transport interests from the main business has inevitably been shelved for the time being.

Overseas Companies

In a generally cheerful market for the shares of overseas electricity companies, the Indian issues are outstanding. Calcutta Electrics, at 35s., and Madras Electrics, at 26s. 3d., have each improved. In each case dividend prospects are uncertain, but have lately been the subject of rising confidence. Elsewhere, Kalgoorlie Electrics, now 12s. 6d., have put on 1s. 6d. in a fortnight and stand substantially higher than at any time last year. Jerusalem Electrics gained further ground to 23s. 6d., and Atlas Electrics staged a recovery of ninepence to 3s. 6d.

Yields of Cable Shares

With the dividend again made up to 16¼ per cent. for the year, the yield of over 5¾ per cent. on Enfield Cable shares at 55s. looks comparatively generous by present standards. The present rate of dividend compares with the 25 per cent. payments regularly distributed up to 1937, when the 60 per cent. share bonus was declared. According to the preliminary statement, profits in 1939 were within £5,000 of the previous year's, which indicates that the distribution remains comfortably covered by earnings. Both British Insulated and Callender's Cable shares are quoted at prices which leave a yield of less than 4½ per cent., calculated on the last paid dividends. In each case, future bonus chances are rated highly. This consideration, together with the financial and trading strength of the concerns, form the justification for the modesty of the immediate return. Johnson & Phillips, at 47s. 6d., show a yield of 5¼ per cent. without taking the increased interim dividend into the reckoning. The return on Henley's shares, at 20s. 9d., is £4 18s. per cent. From all accounts, the cable manufacturers are busily employed in the conditions of the moment.

Equipment and Manufacturing

Following the upward surge of prices towards the end of February, the industrial markets have entered March in a manner to suggest that the effort is by no means spent. Prices have made further headway over the last week, and this despite the fact that such shares as General Electrics, for instance, had already gained 7s. 6d. and British Insulated more than half a sovereign in little more than a month. Matters have apparently been hurried on by anxiety to get idle money invested in advance of the Treasury's payment this week for the requisitioned dollar stocks, and by the rapid evaporation of opportunities to obtain a living rate of interest from equities in the best grades. The temptation to secure capital profits, resulting from a very sharp appreciation of industrial holdings, is held in check by the problem of how to employ the money to better advantage elsewhere, and by the popular belief in the ability of the gilt-edged market to set other markets a yet higher standard of values.

Miscellaneous Matters

The Home Railway market fell from grace on a disappointing dividend decision from the L. & N.E.R.—the last of the big four to publish the 1939 results. The speculative stocks suffered also from the diversion of interest to the Kaffir market, where fresh developments have opened up new scope for the enterprising. Speculative interest appears to have difficulty, at present, in concentrating on more than one market at a time. Cable and Wireless ordinary stock has had a slight setback after the long ascent, although the optimists are going for a small increase over last year's 4 per cent. dividend. Oriental Telephones and Marconi Marines are in demand. Transport and traction stocks have had a revival since publication of the Tillings report, on the belief that one of the chief effects of the restriction of services has been to eliminate much unprofitable working. British Electric Traction preferred, Lancashire Transport and West Ridings are among the favoured shares.

Stock Exchange Anomalies

One of the Stock Exchange anomalies that has arisen out of the present state of war conditions is concerned with what appears to be the disproportionate degree of interest taken by the public in certain stocks and shares, as compared with the indifference shown to certain others. In the former class, investment will buy them up to prices at which the yield on the outlay is little more than can be obtained from safety-first securities. In the second group are to be found shares in companies known to be doing well and from which, on the basis of the last-paid and probable maintainable dividends, the reutrn is satisfactorily high. Why, ask many people—mostly those who hold shares in the second of the two classes—should there be such manifest discrepancy?

The Matter of Marketability

Full explanations would occupy both these columns of notes. Briefly summarised, the reasons are to be found in popularity and marketability. The average investor, as his stockbroker well knows, prefers to put money into shares of a company whose name is familiar, whose activities are a matter of everyday comment, and upon whose prospects the investor feels competent to form his own judgment. The shares that can claim these qualifications will command greater attention and, therefore, attract more buying orders than those which are not so well known and not so frequently in the public eye. The matter of Stock Exchange marketability follows upon the heels of these considerations. Where market transactions are, by comparison, few, the market price will be wider, and the shares will be more difficult to deal in than in the cases of "popular" companies. Again, a large capital, such as the latter usually possess, implies a greater number of shares being available for dealing purposes, which in itself makes for free marketability. The public are prepared to pay, and daily do pay, for this advantage. The fact that, particularly at a time like the present, the reason for anomalies is not always understood, may be pleaded in extenuation of what the informed will perhaps regard as savouring of prolixity and platitude.

ELECTRICAL COMPANIES' SHARES

Prices, Dividends and Yields

Company	1939 Highest	1939 Lowest	Dividend Previous	Dividend Last	Price March 5	Rise or Fall	Yield £ s. d. p.c.
Home Electricity Companies							
Bournemouth and Poole	68/3	56/-	15	15	62/-	—	4 16 10
British Power and Light	30/9	21/-	7	7	29/6	+9d.	4 15 0
City of London	33/9	22/-	7½	7½	27/-	—	5 11 2
Clyde Valley	38/6	26/9	8	8	37/6	−6d.	4 5 5
County of London	46/9	28/-	10½	10½	41/3xd.	+1/-	5 1 8
Edmundson's:							
7% Pref.	31/6	27/6	7	7	30/-	—	4 13 4
Ord.	27/9	18/-	9	6	27/-	—	4 9 0
Elec. Dis. Yorkshire	41/6	32/-	9	9	38/3	—	4 14 2
Elec. Fin. and Securities	48/3	39/-	12½	12½	40/-	—	6 5 0
Elec. Supply Corporation	51/9	40/-	12	12	44/-	—	5 9 0
Isle of Thanet	20/-	15/-	4	4	15/6	—	5 3 3
Lancs Light and Power	34/6	25/-	7½	7½	32/6xd.	+9d.	4 12 4
Llanelly Elec.	22/6	16/6	5½	5½	21/-xd.	+⅛	5 4 9
Lond. Assoc. Electric	30/-	18/-	7	7	20/-	—	7 0 0
London Electric	34/3	20/-	7	7	27/-	—	5 3 8
London Power Deb. Red.	106½	97	5	5	104½	—	4 15 6
Metropolitan	51/-	32/6	12	10	40/-xd.	+6d.	5 0 0
Midland Counties	39/6	30/-	8	8	38/3	—	4 3 4
Mid. Elec. Power	41/9	33/6	8	9	37/6	—	4 16 0
Newcastle Elec.	28/9	25/-	7	7	28/9xd.	+1/-	4 17 5
North Eastern Electric:							
Ordinary	32/3	23/6	7	7	31/-	—	4 10 4
7% Pref.	32/6	26/-	7	7	31/6	—	4 9 0
Northampton	48/-	41/-	10	10	42/6	—	4 15 0
Notting Hill 6% Pref. (£10)	13½	10½	6	6	10½	—	—
Northmet Power:							
Ordinary	46/6	30/6	10	10	41/3	—	4 17 0
6% Pref.	29/-	23/6	6	6	28/6	—	4 4 3
Richmond Elec.	29/-	21/6	7	7	23/9	—	5 18 0
Scottish Power	38/9	27/6	8	8	36/3xd.	—	4 8 4
Southern Areas	22/9	17/-	5	5	20/6	+6d.	4 17 7
South London	30/9	22/-	7	7	22/6	+6d.	6 4 3
West Devon	23/3	18/-	5	5	18/9	—	5 6 8
West Glos.	21/3	15/-	2	2½	18/9	—	2 13 4
Yorkshire Elec.	38/6	27/9	8	8	38/9	—	4 2 5
Overseas Electricity Companies							
Atlas Elec.	4/3	1/6	Nil	Nil	3/6	+9d.	—
Calcutta Elec.	39/-	25/-	10*	10*	35/-	+1/6	—
Cawnpore Elec.	34/6	27/3	10	10	28/9	—	—
East African Power	26/3	20/-	7	7	24/6	—	5 14 3
Jerusalem Elec.	24/6	21/-	7	7	23/-	+6d.	6 1 9
Kalgoorlie (10/-)	10/6	9/-	7½	7	12/6	+6d.	5 12 0
Madras	31/-	21/3	8*	8*	26/3	+½	—
Montreal Power	35½	30	1½	1½	33	—	—
Palestine Elec. "A"	27/3	19/6	7½*	5*	25/-	+⅛	4 0 0
Perak Hydro-electric	19/6	12/6	6	2½	18/9	—	2 13 4
Shawinigan Power	25	20	83cts.	90cts.	23½	+1½	—
Tokyo Elec. 6%	63	33	6	6	70	—	8 11 6
Victoria Falls Power	73/9	60/-	12½	15	72/6	—	4 2 8
Whitehall Investments Pref.	19/6	10/-	7½	7½	17/6	—	8 11 6
Public Boards							
Central Electricity:							
1950–70	112	103	5	5	109	+1	4 11 7
1955–75	115½	104½	5	5	111xd.	+2	4 10 0
1951–73	106½	101	4½	4½	107	+1	4 4 0
1963–98	95½	84	3½	3½	95½	+½	3 13 8
London Elec. Trans Gtd.	88½	83	2½	2½	91½	—	2 10 4
London & Home Counties							
1955–75	107½	105	4½	4½	106½	—	4 4 6
Lond. Passenger Transport							
A	114½	103	4½	4½	113½	—	3 19 3
B	117½	102	5	5	109½	−4	4 11 4
C	83½	64½	1½	—	46xd.	−1½	—
West Midland Joint Elec., 1948–68	112½	104½	5	5	106½xd.	+2	4 14 0
Telegraph and Telephone							
American Tel. & Tel.	210	159	9	9	210½	−2	4 5 8
Anglo-Am. Tel.:							
Pref.	101½	82	6	6	98½	—	6 1 10
Def.	23¾	17	1½	1½	23	—	6 10 4
Anglo-Portuguese	24/-	16/6	8	8	22/6	—	7 2 3
Cable & Wireless:							
5½% Pref.	97	75	4½	5½	96½xd.	—	5 14 8
Ord.	57½	35	4	4	62½	−3	6 8 0
Income	100	85½	—	—	99½	—	4 0 5
Canadian Marconi $1	6/-	3/9	Nil	4	5/6	—	—
Globe Tel. & Tel.:							
Ord.	32/3	22/6	7½*	7½*	31/3xd.	+1/6	4 16 0
Pref.	26/9	20/-	6	6	27/6xd.	+6d.	4 7 5
Great Northern Tel. (£10)	38	18	20	20	19½	—	10 5 4
Inter. Tel. & Tel.	10½	5	Nil	Nil	5	—	—
Marconi-Marine	30/-	23/-	7½	10	30/-	+⅛	6 13 4
Oriental Telephone Ord.	2½	42/6	12*	12*	2⅝	+⅛	4 11 5
Telephone Props.	14/-	12/9	5	6	13/9	—	8 14 6
Telephone Rentals (5/-)	10/-	6/3	10	10	8/6	−6d.	5 17 8
Western Union	40½	19½	2½	—	32½	—	—
Traction and Transport							
Anglo-Arg. Trams:							
First Pref. (£5)	7/6	3/6	Nil	Nil	4/-	—	—
4% Inc.	16	5	Nil	Nil	9	—	—
British Electric Traction:							
Def. Ord.	950	500	5	5	800	−25	—
Pref. Ord.	164	115	8	8	165	+5	4 17 0
Bristol Trams	52/6	35/-	10	8*	48/3	—	3 6 6
Brazil Traction	13	6½	$1	50c.	10½	+¼	—
Calcutta Trams	25/6	20/9	8	8	23/6	+6d.	6 16 2
Cape Elec. Trams	18/-	16/9	5	5	17/-	—	5 17 8
Lancs Transport	37/9	27/6	10	10	33/9	+⅛	5 18 6
Mexican Light:							
1st Bonds	35	20	5	5	30½	—	—
Rio 5% Bonds	82	47	5	5	82½	+4½	6 1 2
Southern Rly.:							
5% Prefd.	75½	48	5	5	73xd.	−1	6 17 0
5% Pref.	99½	79	5	5	102½xd.	+2	4 17 6
T. Tilling	2½	32/6	10	10	44/6	−6d.	4 10 0
Tilling & B.A.	54/6	43/9	9*	8*	47/6	—	3 7 10
West Riding	37/9	30/-	10	10	34/6	+1/-	5 16 8
Equipment and Manufacturing							
Aron Electricity Ord.	32/3	17/6	15	15	17/6	—	—
Assoc. Elec.:							
Ord.	45/3	30/-	10	10	42/6	—	4 14 0
Pref.	36/6	30/-	8	8	35/-	—	4 11 5
Automatic Telephone & El.	48/9	37/-	10	12½	47/6	+½	5 5 2
Babcock & Wilcox	48/-	37/-	10	12½	48/9	−9d.	5 2 6
British Aluminium Ord.	61/3	48/-	12½	12½	53/9	−⅛	4 13 0
British Insulated Ord.	88/-	70/3	20	20	92/6	+½	4 6 6
British Thermostat (5/-)	16/-	11/6	18½	18½	15/-	—	6 3 4
British Vacuum Cleaner (5/-)	22/6	8/-	40	12½	12/6	—	5 0 0
Brush Ord.	5/9	2/6	Nil	Nil	4/6	—	—
Callender's	92/-	50/-	20	15	67/6	+⅛	4 9 0
Chloride Elec. Storage	82/-	62/-	20	15	3½	—	4 5 9
Consolidated Signal	96/-	60/-	36½	17	3	—	5 4 7
Crabtree (10/-)	25/6	16/6	17½	17½	24/6	+3/3	7 1 8
Crompton Parkinson:							
Ord. (5/-)	21/-	12/6	15	20	20/-	—	5 0 0
E. K. Cole (5/-)	9/-	2/6	10	Nil	3/6	—	—
Elec. & Musical Industries (10/-)	14/9	6/6	5	Nil	9/-	+6d.	—
Electric Construction	40/6	28/-	12½	13½	36/3	—	7 8 9
Enfield Cable Ord.	58/-	37/6	25	16½	55/-	—	5 18 3
Electrical Switchgear (10/-)	27/-	23/-	16	10	21/3	—	4 14 3
English Electric	36/6	25/-	10	10	33/3	—	6 1 0
Ensign Lamps (5/-)	16/9	13/9	25	25	15/-	—	8 6 8
Ericsson Tel. (5/-)	43/-	32/3	25*	25*	37/6	—	3 6 8
Ever Ready (5/-)	26/6	16/9	35	30	27/3	+9d.	5 10 2
Falk Stadelmann	27/-	18/-	10	6	17/6	—	6 17 4
Ferranti Pref.	25/6	21/-	7	7	23/9	—	5 18 0
G.E.C.:							
Pref.	32/9	25/-	6½	6½	32/6	—	4 0 0
Ord.	82/-	61/-	17½	20	82/6	—	4 16 10
Greenwood & Batley	29/-	20/-	7	15	25/-	—	12 0 0
Hall Telephone (10/-)	22/3	7/-	15	15	18/9	—	8 0 0
Henley's (5/-)	21/-	13/9	20	20	20/9	−6d.	4 18 1
4½% Pref.	23/-	18/-	4½	4½	20/-	—	4 10 0
Hopkinsons	46/9	37/-	12½	15	46/3	+⅛	6 9 10
India-Rubber Pref.	22/-	17/9	5½	5½	20/-	—	5 10 0
Intl. Combustion	121/3	97/-	32½	32½	5⅞	—	5 10 6
J. Lucas	61/-	42/6	15	15	60/-	—	5 0 0
Johnson & Phillips	42/6	32/-	12½	12½	47/6	—	5 5 1
Lancashire Dynamo	72/-	50/-	25	25	57/6	—	8 14 0
Laurence Scott (5/-)	12/-	8/6	15	15	10/-	—	7 10 0
London Elec. Wire	31/6	25/-	12	7½	25/-	—	6 0 0
Mather & Platt	50/3	37/6	13½	10	42/6	+⅛	4 14 1
Metropolitan Elec. Cable Pf.	21/3	21/-	5½	5½	21/3	—	5 3 6
Murex	85/9	63/9	20	20	85/-	−⅛	4 14 1
Pye Deferred (5/-)	11/6	7/-	25	25	7/6	—	16 13 4
Revo (10/-)	35/6	22/-	17½	17½	22/6	—	7 15 7
Reyrolle	61/-	52/-	12½	12½	58/9	—	4 5 0
Siemens Ord.	26/9	17/-	7½	7½	23/9	—	6 6 4
Strand Elec. (5/-)	5/6	1/3	10	4	2/-	—	8 0 0
S. Smith (1/-)	9/6	5/6	37½	50	7/6	—	6 13 4
Switchgear & Cowans (5/-)	15/-	9/6	20	20	11/3	—	8 18 0
Telegraph Condenser (10/-)	7/6	5/-	5	—	8/9	+3d.	—
Telegraph Construction	2½	27/6	10	10	37/6	—	5 6 8
Telephone Mfg. (5/-)	10/-	7/-	9	9	8/9	+3d.	5 2 10
Tube Investments	91/6	68/-	23¾	23¾	96/3	—	4 19 0
Vactric (5/-)	4/3	2/-	4	Nil	2/6	—	—
Vickers (10/-)	24/6	14/6	10	10	21/3	—	4 14 1
Ward & Goldstone (5/-)	22/6	19/6	20	20	19/9	—	5 1 3
Westinghouse Brake	54/9	38/-	17½	10	43/9	—	4 11 5
Walsall Conduits (4/-)	31/9	21/3	55	55	26/3	—	8 7 8
West, Allen (5/-)	7/6	5/-	7½	10	7/-	—	7 2 10

* Dividends are paid free of Income Tax.

CONTRACT INFORMATION

Particulars of work for which tenders are invited, contracts placed, and building schemes promising work for electrical contractors and traders

Contracts Open

Where "Contracts Open" are advertised in our "Official Notices" section the date of the issue is given in parentheses. Further details of items marked with an asterisk can be obtained from the Department of Overseas Trade (Inquiry Room), Great George Street, London, S.W.1.

Australia.—BRISBANE.—April 16th. City Electric Light Co. 44-, 33- and 11-kV metal-clad switchgear. (T. 16129/40.)

MELBOURNE.—April 30th. State Electricity Commission of Victoria. Two 66-kV transformers and one voltage and phase angle regulating equipment. (T.Y. 16494/40.)*

Barnoldswick. — March 9th. U.D.C. Two 750-kVA indoor type oil-cooled transformers, two triple-pole metal-clad oil circuit-breaker units and p.i. cables for one year. (March 1st.)

Belfast.—March 8th. Electricity Committee. Electrical materials. (February 23rd.)

Bristol.—March 14th. Electricity Department. V.i.r., lead and tough rubber cables, flexibles, etc. (See this issue.)

Bury.—March 19th. Electricity Department. 6,600 V switchgear and four 750 kVA transformers. (See this issue.)

Dumfries.—March 12th. County Council. Various works, including electrical, incidental to improvements at Thornhill Rest House. County clerk.

Eire. — ROSCOMMON. — March 29th. County Board of Health and Public Assistance. Pumps, motors, and float controlled automatic stopping and starting gear. J. Kilmartin, Board of Health Office (deposit £2 2s.).

Enfield. — Enfield, Edmonton and Potters Bar Joint Hospital Board. Electric van. (See this issue.)

India. — NEW DELHI.—April 4th. Stores Department. Wall plugs and ceiling roses. (T. 16398/40.)*

MADRAS.—March 27th. Electricity Department. Additional plant for the Bezwada thermal scheme comprising one 3,000-kW steam turbo-alternator set, one 33,000-lb. per hr. boiler and accessories, indoor and outdoor switchgear and accessories, and extension of pipework. Specification E.131 from the Executive Engineer, Electrical and Mechanical Division, Chepauk (Rs. 25 per set).

April 9th. One 1,500 kVA, 3.3/11-33 kV power transformer and arc suppression coil for Bezwada scheme. Specification E.132 from the Executive Engineer, as before. (Rs.10 each).

Leeds.—March 12th. Education Committee. Various works, including electrical, to buildings for twelve months commencing April 1st. G. Guest, director of education, Calverley Street.

London. — COMMISSIONERS OF H.M. WORKS.—March 21st. Electrical wiring installation in the West Midlands Area. (See this issue.)

March 29th. Three large electric wiring installations in the West of England. (See this issue.)

Linslade (BUCKS).—March 8th. U.D.C. Additions to existing pumping station, including a vertical spindle centrifugal borehole pump of 7,500 gal. per hour capacity, driven by an electric motor and arranged for automatic operation, with recording equipment, &c. Sands & Walker, Milton Chambers, Nottingham (deposit £2 2s.).

Littleborough.—We regret that in our issue of February 16th a contract note was published erroneously under Littlehampton instead of Littleborough.

Manchester.—March 8th. Electricity Committee. Neutral earthing switchgear and resistors. (February 23rd.)

March 20th. Cables and service cut-outs for one year. (See this issue.)

New Zealand. — WELLINGTON.—Public Works Department. May 14th. Control and relay panels. (T. 16070/40.)*

May 21st. Control and relay panels. (T. 16069/40.)*

May 21st. Public Works and Tenders Committee. Control and relay panels for Mt. Roskill substation, Auckland. (T. 16068/40.)*

Norwich.—March 11th. Town Council. One Lancashire steam boiler with electrically driven mechanical stoker. City engineer, City Hall (deposit £2).

Omagh.—March 14th. Mental Hospital Joint Committee of Management. Electrical requisites for three months. O. L. Walsh, Clerk to the Joint Committee, Omagh Mental Hospital.

Salford.—March 20th. Corporation. One 100/150-A mercury-arc rectifier. (See this issue.)

Sheffield.—March 11th. Town Council. Two sets of totally enclosed double-helical double-reduction gear units and three sets of horizontal centrifugal pumps coupled to automatically controlled electric motors. J. H. Henderson, Sewage Disposal Department, Wincobank (deposit £1 1s. each item).

South Africa.—PRETORIA.—Union Tender and Supplies Board. March 28th. Laundry machinery and electric motor with switchgear. (T. 16791/40.)* Refrigerating plant. (T. 16792/40.)*

March 28th. Public Works Department. Self-cooled type transformer and one high-voltage and one low-voltage switches. (T.Y. 16794/40.)*

JOHANNESBURG. — April 10th. City Municipal Council. 1,600 sets of insulated type house service cut-outs and 288 spare fuses. (T. 16812/40.)*

April 22nd. Railways and Harbours Administration. 15-ton electrically driven Goliath crane. (T. 16786/40.)*

PORT ELIZABETH.—April 25th. Municipality. Four 4,000-kVA. three-phase transformers. (T.Y. 16809/40.)*

Straits Settlements.—SINGAPORE.—May 27th. Municipal Water Department. Electrically driven main supply and wash water pumping sets. (T.Y. 16797/40.)*

Walsall.—March 28th. Electricity Department. Eight 400-kVA and one 500-kVA transformers. (See this issue.)

Wolverhampton. — April 2nd. West Midlands J.E.A. 11,000 V cables in Wellington. (See this issue.)

Orders Placed

Cardiff.—Electricity Committee. Accepted. Cables.—Aberdare Cables. Coal handling plant.—Fraser & Chalmers. Switchgear for twelve months.—Whitehead Switchgear; Ferguson, Pailin; G.E.C.

Transport Committee. Accepted. Rectifier for bus-garage charging plant—Edison Swan Electric Co.

Dundee.—Electricity Committee. Accepted. Cable (£3,882).—Aberdare Cables.

Eccles. — Electricity Committee. Accepted. Equipment for increased supply to Morley Manufacturing Co., Bright Road: Switchgear cubicle. — English Electric Co. Metering equipment.—Landis & Gyr.

Financial Section (*Concluded from page 290*)

Reports and Dividends—contd.

£26,026 as compared with the previous year. The final dividend is 15 per cent., less tax, making 30 per cent. for the year (against 25 per cent.). The shares involved in the recent bonus issue of 50 per cent. do not rank for the final dividend now announced.

R. A. Lister & Co., Ltd., are to offer the balance of the unissued capital (60,779 £1 shares) in new ordinary shares to existing holders at 50s. per share. Treasury consent has been obtained to the issue.

Broadcast Relay Service, Ltd.—To meet capital requirements for expansion, the company has issued for cash £100,000 in 5½ per cent. redeemable cumulative preference shares of £1 each and £50,000 nominal in ordinary shares. Both classes have been placed privately. The preference shares rank for dividend from the date upon which they were allotted, but the ordinary shares will not be entitled to the final dividend for the year ending March, 1940.

The Notting Hill Electric Lighting Co., Ltd., reports a net revenue for 1939 of £39,456, as compared with £51,126 in 1938, plus investment income (£62). and transfer from mains reserve £5,295. Interest absorbs £6,804, premium on debenture redemption £65, and sinking funds require £35,174. The interim preference dividend took £4,350, leaving a balance carried forward of £15. In the previous year an ordinary dividend of 5 per cent. was paid and £1,594 was carried forward.

Charles Clifford & Son, Ltd., report a balance on profit and loss account for 1939 of £22,509. A final dividend of 1s. per share is paid on the ordinary shares, making 10 per cent., tax free, for the year, plus a bonus of 1s. 6d. per share, tax free. War contingency reserve receives £10,000, and £22,497 is carried forward (against £22,288 brought in).

Bruce Peebles & Co., Ltd., have declared a dividend for 1939 of 5 per cent. on the ordinary stock, plus a bonus of 3 per cent., making 8 per cent. This compares with a dividend of 5 per cent. and a bonus of 2 per cent. for 1938.

The National Gas & Oil Engine Co., Ltd., reports a profit for 1939 of £32,787. The ordinary dividend for the year is 2½ per cent., and £21,503 is carried forward (against £19,717 brought in).

The Ceara Tramway Light & Power Co. reports a net revenue for the year to June 30th of £13,015 as compared with £23,909 for 1937-38. Depreciation requires £10,000 and debenture interest, &c., £16,884, leaving a deficiency for the year of £5,668, which has been transferred to reserve for contingencies.

Rawlplug, Ltd., has declared a final dividend of 30 per cent., making 40 per cent. for the year (unchanged).

Pye (Ireland) is paying a first and final dividend of 7½ per cent. (against 5 per cent.).

The Globe Telegraph & Trust is maintaining its quarterly dividend at 1¼ per cent. net.

Cable and Wireless (Holding), Ltd., announces a dividend on the preference stock of 2¾ per cent., less tax at 8s. 5d., for the half-year ended December 31st.

The Cables Investment Trust is again paying an interim dividend of 2 per cent.

Worthington-Simpson, Ltd., are paying an ordinary dividend for 1939 of 10 per cent. (against 7 per cent.).

The Mid-Cheshire Electricity Supply Co., Ltd., reports a net profit for 1939 of £46,417, as compared with £42,669 in 1938. The first and final dividend is unchanged at 8 per cent.

The Mersey Power Co., Ltd., is paying a first and final dividend of 8 per cent. (same).

The Canadian Marconi Co. is paying on June 1st a maiden dividend of 4 per cent.

The Pennsylvania Water & Power Co. is paying an interim dividend of $1 per share for the quarter to March 31st (same).

Holophane, Ltd., is not paying an interim dividend this year (against 4 per cent.).

The General Electric Co. (U.S.A.) has declared a quarterly dividend of 35 cents per share (against 25 cents a year ago). The net income for 1939 is $41,236,000, equal to $1.43 per share (against $27,729,000 or 96 cents).

Finchley.—Electricity Committee. Accepted. Electrical installations in school trenches (£1,159).—Harland & Wolff.

Glasgow. — Health Committee. Accepted. Bed lift at Southern Hospital (£703).—Waygood-Otis.

Hastings.—Electricity Committee. Recommended. Circuit-breaker (£129).—A. Reyrolle & Co.

Heston and Isleworth.—Town Council. Recommended. One e.h.v. switch-truck and housing in the Wellington Road substation at Hounslow (£260).—Switchgear and Equipment.

Kingston-on-Thames.—Borough Council. Accepted. Switchgear.—G.E.C.

London.—ST. MARYLEBONE.—Emergency Committee. Accepted. Direction and location signs.—Bratt, Colbran; Burnham & Co.

Manchester.—Health Committee. Accepted. X-ray plant for Baguley Sanatorium.—Mottershead & Co.

Electricity Committee. Accepted. 20-kW mercury-arc rectifier equipment.—Hewittic Electric Co. Batteries and charging equipments.—Siemens Bros. & Co.; Nife Batteries; Britannia Batteries. Electric cookers for twelve months.—Carron Co.; Moffats; Simplex Electric Co.; Revo Electric Co.; English Electric Co.

Mansfield.—Electricity Committee. Accepted. Seven-panel, 3,000-V switchboard (£1,453).—Ferguson, Pailin. Two panel, 11,000-V switchboard (£396).—Crompton Parkinson. One 2,500-kVA regulating transformer and control gear (£563).—G.E.C.

Newark (NOTTS).—Electricity Committee. Accepted. L.v. switchgear (£166).—Brush Electrical Engineering Co. H.v. switchgear (£184). — Switchgear and Cowans.—500-kVA transformer (£245).—Bryce, Ltd. Cable (£181).—B.I. Cables.

Stoke-on-Trent.—Electricity Committee. Accepted. Supplies for twelve months: Mains and cables.—Callender's. Extra-high-voltage substation switchgear and static transformers.—Met.-Vick. Electl. Co.

West Ham.—Borough Council. Accepted. Two electric passenger lifts at Whipps Cross Hospital.—Marryatt & Scott.

Contracts in Prospect

Particulars of new works and building schemes for the use of electrical installation contractors and traders. Publication in this section is no guarantee that electrical work is definitely included. Alleged inaccuracies should be reported to the Editors.

Alloa. — Refrigerating plant, Alloa Brewery, Whins Road; A. Arrol & Sons, Ltd.

Ashton-under-Lyne.—Saw mill, Katherine Street, for Webster Holt & Co., Ltd., Moss Saw Mills; William Norgrove & Sons, Ltd., contractors, Kirkley Saw Mills, Hyde.

Works, Ryecroft Mill; Cooke & Ferguson, Ltd., Victoria Steel Works, Manchester.

Works, Kenworthy Mill; Denton Street Metal & Engraving Co., 42, Hyde Road, Denton.

Audenshaw.—Additions, Golden Shred Works, for J. Robertson & Sons, Ltd.; W. H. George & Son, architects, 7, Warrington Street, Ashton-under-Lyne.

Barking.—Factory extensions, Glenny Road; W. H. Sugden & Co.

Factory extensions, Alfreds Way; Victor Blagdon & Co.

Billingham—(CO. DURHAM). — Rebuilding of joiners' shop destroyed by fire at the Furness Shipyard, Haverton Hill.

Birkenhead. — Stores, New Chester Road; British Leather Co., Ltd.

Blackburn. — Brewery reconstruction (£80,000), Lower Ednam, for Dutton's Blackburn Brewery, Ltd.; Yates, Cooke and Darbyshire, architects, 43, Great Marlborough Street, London, W.1.

Bletchingley. — Extensions, Isolation Hospital, for Caterham and Godstone Joint Hospital Board; Stanley Easter, architect, Council Offices, Oxted, Surrey.

Brighouse. — Fire station, Halifax Road; H. A. Sneezum.

Extensions to Clifton Bridge Mill, Wakefield Road; Woodhouse & Mitchell, Ltd.

Additions to Works, Brookfoot Lane; J. C. Bottomley & Emerson, Ltd.

Brighton.—Factory extensions, East Moulscombe; Allen West & Co., Ltd.

Brynmawr.—Fire station, for U.D.C.; J. J. Quirk, surveyor, Council Offices.

Cardiff.—Warehouse, Bute Street and Wharf Street; Rogers and Davies.

Cheshire.—Laundry extensions, fire station, huts, &c., Parkside Mental Hospital; county architect, The Castle, Chester.

Coalville (LEICS).—Factory extensions for Cascelloid, Ltd., Abbey Lane, Leicester.

Additions to works, Forest Road, Hugglescote, for Eatough's, Ltd., Earl Shilton.

Consett.—Extensions to works; Consett Iron Co.

Corby (NORTHANTS).—Shops and flats, High Street, for Sarrington Bros.

Edmonton.—Houses (52), Hoe Lane Estate, Enfield; E. J. Willis, engineer. Town Hall, N.9.

Eire.—DUN LAOGHAIRE.—Houses (168), Monkstown Farm, and (40), Temple Hill, Blackrock; T. C. O'Mahony, borough manager and town clerk, Town Hall, Dun Laoghaire.

LIMERICK.—Proposed regional hospital (£300,000), site at Dooradoyle, for County Board of Health.

Enfield.—Factory and offices, Queensway; British Electric Resistance Co.

Factory extensions, Southbury Road; A. H. Durnford.

Church Hall, Addison Road; Hardun & Sons, Ltd.

Finchley.—Blocks of flats, Red Lion Hill estate; borough engineer.

Grantham.—Houses; P. Benn, borough engineer.

Gloucester.—Development of Quedgeley House estate; R.D.C. surveyor.

Halesowen.—Factory extension, Cardale Street, Cakemore Malleable Iron Products Co., Cardale ,Street, Blackheath.

Factory extension, Masters Lane, Cakemore, for Premier Stamping and Engineering Co., Ltd., Blackheath.

Works extension; W. Slater & Co., Quinton, Birmingham.

Bank, High Street, Birmingham Municipal Bank, Broad Street, Birmingham.

Helmsley (YORKS).—Fire station; R. P. Brotton & Sons, architects, Chop Gate, Middlesbrough.

Hyde.—Reconstruction of furnishing department at Newton for F. W. Ashton, Ltd., Newton Bank Print Works, Hyde; J. W. Swindells, Ltd., contractors, Church Road, New Mills, via Stockport.

Ilford.—Additions, Uphall Works, Uphall Road; Howards & Sons, Ltd.

Additions, Huson Works, New North Road; S. A. S. Yeo.

Additions, Wange Works, High Road; J. Burns, Ltd.

Factory extensions, Hainault Road; Haines & Warwick.

Jarrow (CO. DURHAM).—Two communal centres in High Street and at Springwell; J. S. Weir, Town Hall, Jarrow.

Kettering.—Reconstruction, Swan Inn. Montagu Street, including winter gardens, for Northampton Brewery Co., Ltd.

Large clothing factory, School Lane, for Wallis and Linnell.

Middlesbrough.—Extensions to North Ormesby Hospital; W. A. King and Sons, Ltd., builders, Westbourne Grove, North Ormesby, Middlesbrough.

Middlesex.—Secondary school, Spring Grove, Isleworth; county architect, Great George Street, S.W.1.

Newport (MON). — Large factory, Courtybella Works; C. Howard Crane, architect, Romney House, Marsham Street, London, S.W.1.

Northampton.—Flats, Grafton Street; Ideal Benefit Society.

Factory extensions, Newland; Lotus, Ltd.

Factory reconstruction, Stanley Road; C. & E. Lewis.

North Riding.—Proposed schools, Bedale and Easingwold, for E.C.; county architect, County Hall, Northallerton.

Northumberland. — Schemes proposed by County Council: Police quarters at Morpeth; new police headquarters at Blyth; senior and junior school at Bellingham; temporary accommodation at Throckley School; and new technical school at Ashington; W. W. Tasker, county architect, County Offices, Morpeth.

Peterborough. — Pumping station, Etton; city engineer, Town Hall.

Raunds.—Factory extensions, for Tebbutt and Hall Bros., Ltd., Coleman Street.

Rotherham.—Works additions, Mangham Road; South Yorks Chemical Works, Ltd.

Rugby.—Pumphouse, Avon Works; T. and C. Hawksley, civil engineers, 34, Old Queen Street, Westminster, S.W.1.

Stoke-on-Trent. — Factory, for Briggs Motor Bodies, Ltd., Chequers Lane, Dagenham.

Sunderland.—Toy factory (electrically equipped); J. E. Lewis, borough engineer.

Usworth (CO. DURHAM). — Pithead baths for the Miners' Welfare Committee (£18,000); Stanley Miller, Ltd., builders, 17, North Street, Newcastle-on-Tyne.

Walthamstow.—Crematorium, &c., for B.C.; T. A. Cunningham, architect, Town Hall.

Warrington. — Works additions; J. Crosfield & Sons, Ltd.

Additions to bottling stores, Wilderspool Causeway; Greenall, Whitley & Co., Ltd.

Warwickshire. — Extensions, St. Edward's R.C. School, Coleshill, and workshop block at Nuneaton technical college; county architect, Shire Hall, Warwick.

Wellingborough.—Leather store, Summerlea Road, Finedon; Gammidge & Co.

West Bromwich. — Welfare centre, Stone Cross; borough engineer.

Works extensions, Albion Road; Fordath Engineering Co., Ltd.

West Drayton.—Extensions to factory, for Power Plant Co., Ltd.

FORTHCOMING EVENTS

Institution of Electrical Engineers.—Monday, March 11th. Institution, London, W.C.2. 6 p.m. Informal meeting. Discussion on "Emergency Repairs of Plant with Special Reference to Welding." To be opened by Dr. S. F. Dorey. (Joint meeting with the Institutions of Civil and Mechanical Engineers.)

Transmission Section. — Wednesday, March 13th. Institution, London, W.C.2. 6 p.m. "Electric Cables & Fire Risks: Recent Developments & Investigations." By S. W. Melsom.

Meter & Instrument Section.—Friday, March 15th. Institution, London, W.C.2. 6 p.m. Informal meeting. Discussions on "Cathode-ray & Duddell Type Oscillographs: Advantages and Disadvantages of Audio-frequencies." To be opened by Prof. J. T. MacGregor-Morris. "What Are the Practical Limits of Error in AC House Service Meters and in Substandard Watt Meters?" To be opened by A. J. Pitt.

North Midland Centre. — Saturday, March 9th. Hotel Metropole, Leeds. 2 p.m. Discussion on "Fire-fighting Equipment for Electrical Installations (based on the E.R.A. Report)." To be opened by J. Hacking and R. A. McMahon.

North-Eastern Centre.—Monday, March 11th. The Newe House, Newcastle-on-Tyne. 6.15 p.m. "Oil-less Metalclad Switchgear for Medium-voltage AC Circuits Up to 660-V, Three-phase," By H. E. Cox and L. Drucquer.

Association of Mining Electrical Engineers (*South Wales Branch*).—Saturday, March 9th. South Wales Institute of Engineers, Cardiff. 5.30 p.m. "Electric Shock & its Effect on the Human Body." By G. M. Harvey and S. W. Fisher.

Society of Chemical Industry (*Plastics Group.*)—Monday, March 11th. Northumberland Rooms, London, W.C.2. 7.15 p.m. "The Chemist & Electrical Insulation." By L. Massey (Joint meeting with the Institution of Rubber Industry).